Non-Federal Navigation Facilities

This edition replaces the existing loose-leaf Part 171 and its changes.

This FAA publication of the basic Part 171, effective October 1, 1964, incorporates Amendments 171-1 through 171-16 with preambles.

Published
September 1992

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Subpart A—VOR Facilities

171.1	Scope	A–1
171.3	Requests for IFR procedure	A–1
171.5	Minimum requirements for approval	A–1
171.7	Performance requirements	A–1
171.9	Installation requirements	A–2
171.11	Maintenance and operations requirements	A–3
171.13	Reports	A–4

Subpart B—Nondirectional Radio Beacon Facilities

171.21	Scope	B–1
171.23	Requests for IFR procedure	B–1
171.25	Minimum requirements for approval	B–1
171.27	Performance requirements	B–1
171.29	Installation requirements	B–2
171.31	Maintenance and operations requirements	B–2
171.33	Reports	B–3

Subpart C—Instrument Landing System (ILS) Facilities

171.41	Scope	C–1
171.43	Requests for IFR procedure	C–1
171.45	Minimum requirements for approval	C–1
171.47	Performance requirements	C–1
171.49	Installation requirements	C–2
171.51	Maintenance and operations requirements	C–2
171.53	Reports	C–3

Subpart D—True Lights

171.61	Air navigation certificate: Revocation and termination	D–1

Subpart E—General

171.71	Materials incorporated by reference	E–1
171.73	Alternative forms of reports	E–1
171.75	Submission of requests	E–1

Subpart F—Simplified Directional Facility (SDF)

171.101	Scope	F–1
171.103	Requests for IFR procedure	F–1
171.105	Minimum requirements for approval	F–1
171.107	Definition	F–1
171.109	Performance requirements	F–2
171.111	Ground standards and tolerances	F–4

Subpart G—Distance Measuring Equipment (DME)

171.151 Scope G–1
171.153 Requests for IFR procedure G–1
171.155 Minimum requirements for approval G–1
171.157 Performance requirements G–1
171.159 Installation requirements G–2
171.161 Maintenance and operations requirements G–3
171.163 Reports G–4

Subpart H—VHF Marker Beacons

171.201 Scope H–1
171.203 Requests for IFR procedure H–1
171.205 Minimum requirements for approval H–1
171.207 Performance requirements H–1
171.209 Installation requirements H–2
171.211 Maintenance and operations requirements H–2
171.213 Reports H–3

Subpart I—Interim Standard Microwave Landing System (ISMLS)

171.251 Scope I–1
171.253 Definitions I–1
171.255 Requests for IFR procedures I–2
171.257 Minimum requirements for approval I–2
171.259 Performance requirements: General I–2
171.261 Localizer performance requirements I–4
171.263 Localizer automatic monitor system I–6
171.265 Glide path performance requirements I–6
171.267 Glide path automatic monitor system I–7
171.269 Marker beacon performance requirements I–8
171.271 Installation requirements I–8
171.273 Maintenance and operations requirements I–8
171.275 Reports I–10

Subpart J—Microwave Landing System (MLS)

171.301 Scope J–1
171.303 Definitions J–1
171.305 Requests for IFR procedure J–2
171.307 Minimum requirements for approval J–2
171.309 General requirements J–2
171.311 Signal format requirements J–3
171.313 Azimuth performance requirements J–25

171.321 DME and marker beacon performance requirements J–38
171.323 Fabrication and installation requirements J–39
171.325 Maintenance and operations requirements J–40
171.327 Operational records .....

May 7, 1964 (28 F.R. 6017), and given further distribution as Notice No. 64–24.

Many of the comments received recommended specific substantive changes to the regulations. Although many of the recommendations appear to be meritorious, they cannot be adopted as a part of the recodification program. The purpose of the program is simply to streamline and clarify present regulatory language and delete obsolete or redundant provisions. To attempt substantive changes, other than relaxatory ones that are completely noncontroversial, would delay the project and be contrary to the ground rules specified for it in Draft Release 61–25. However, as stated in Notice No. 64–24, it is recognized that the substantive contents of this regulation are in need of updating and revision, and the Agency is now in process of preparing a substantive revision to be published as a separate notice of proposed rule making. The substantive comments received as a result of the circulation of the notice will be considered in the substantive revision.

Apart from comments of the nature described above, very few comments were received on the notice. Two comments suggested deletion of the rule that requires the owner to obtain the permission of the FAA before shutting down a facility. The comments indicate some misunderstanding of, the purpose of the provision, which is simply to allow the FAA an opportunity to notify the public of the shutting down of the facility concerned and to provide substitute service, if possible under the circumstances. It should be understood that this entire regulation applies only to facilities that have a public use aspect and the permission of the FAA is therefore required in the interest of protecting public use of the facility. In no case would permission to close the facilities be arbitrarily denied. It would be delayed only until the FAA's published procedures were appropriately modified.

Two of the comments suggested that § 171.31(b)(10) be changed to delete the requirement of monitoring each MH facility on a one-half hour basis. Deletion of this language might have the adverse affect of requiring the facility to be continuously monitored. In some cases this could thereby increase the burden and, under the ground rules explained above, such a change could not be accomplished in the recodification program.

One comment suggested that sections of the regulation that make reference to other documents, such as ICAO standards, also give information on how to obtain copies of them. This comment has merit and therefore language has been added to show where copies of these documents may be obtained.

The definitions, abbreviations, and rules of construction contained in Part 1 [New] of the Federal Aviation Regulations apply to Part 171 [New]. This amendment, as the first rule to be published in Subchapter J "Navigational Facilities", adds that subchapter to the Federal Aviation Regulations.

Interested persons have been afforded an opportunity to participate in the making of this regulation, and due consideration has been given to all relevant matter presented. The Agency appreciates the cooperative spirit in which the public's comments were submitted.

In consideration of the foregoing, effective October 1, 1964, Chapter I of Title 14 is amended by adding a new Subchapter J reading as follows, and Chapter III of Title 14 is amended by deleting Part 407.

This amendment is issued under the authority of 305, 307, 313(a), 601, and 606 of the Federal Aviation Act of 1958 as amended (49 U.S.C. 1346, 1348, 1354(a), 1421, and 1426).

a "true light" as an aid to air navigation. Under the Federal Aviation Regulations, such a provision belongs in Part 171—"Non-Federal Navigation Facilities". Therefore, a new Subpart D is being added to Part 171, recodifying 408.17(a) of the Regulations of the Administrator.

This addition to Part 171 completes the recodification of Part 408 and enables the Agency to delete the Regulations of the Administrator in Chapter III of Title 14 of the Code of Federal Regulations. All other Parts in this Chapter have been previously codified. Those sections of Part 408 neither heretofore recodified nor being recodified in Part 121 have been determined to be surplusage. Their substance either duplicates other provisions in the Federal Aviation Regulations or is advisory only.

In addition, it is no longer necessary to use the word "[New]" when referring to a Part of the Federal Aviation Regulations. This is possible because all Civil Air Regulations in Chapter I of Title 14, with the issue of Part 121, have now been replaced by Federal Aviation Regulations.

In consideration of the foregoing, Part 171 of the Federal Aviation Regulations (14 CFR Part 171) is amended, effective April 1, 1965.

This amendment is made under the authority of 307, 313(a), 314, 501, 601–610, 902(c), 1102, 1110, and 1202 of the Federal Aviation Act of 1958 (49 U.S.C. 1348, 1354(a), 1355, 1401, 1421–1430, 1472(c), 1502, 1510, and 1522).

Amendment 171–2

Scope of Applicability of the Regulation of Non-Federal Navigation Facilities

Adopted: March 31, 1966 **Effective: May 30, 1966**

(Published in 31 F.R. 5408, April 6, 1966)

On October 15, 1965, a notice of proposed rule making was published in the Federal Register (30 F.R 13169) stating that the Federal Aviation Agency proposed to broaden the applicability of Part 171.

Interested persons were afforded an opportunity to participate in the rule making through submission of comments. Due consideration was given to all relevant matter presented.

The purpose of this amendment is to broaden the applicability of Part 171 to include all non-Federal navigation facilities for which IFR procedures are requested or established. Under the present rule, the term "public use facility" is generally interpreted as meaning those facilities which are available to the public and have standard instrument approach procedures contained in the Federal Aviation Regulations, Part 97. The Agency believes that its responsibility to the general public goes beyond the present limited scope of Part 171. By expanding the applicability of Part 171, the new rule sets forth one standard for all non-Federal facilities that are to be used for IFR operations. This rule establishes standards that assure reliability and thereby provides for safer operations at all of these facilities. The Agency believes this amendment to be of special importance since these non-Federal facilities may be used for the transportation of passengers for hire.

Comments received on the notice of proposed rule making (30 F.R. 13169) raised three issues with respect to this amendment. One comment stated that it will be overly burdensome on maintenance personnel to accompany the FAA inspector on each inspection trip, especially where an operator may own several facilities. The Agency does not, however, feel that it should conduct these inspections on the private property of the facility owner without the owner being represented in some way. The rule has been relaxed so that any representative of the owner will be acceptable after the initial inspection.

In consideration of the foregoing, effective May 30, 1988, Part 171 is amended.

This amendment is made under the authority of secs. 305, 307, 313(a), 601, and 606 of the Federal Aviation Act of 1958, 49 U.S.C. 1346, 1348, 1354(a), 1421 and 1426.

Amendment 171–3

Alternative Formats of Reports

Adopted: May 10, 1967 **Effective: May 17, 1967**

(Published in 32 F.R. 7331, May 17, 1967)

The purpose of this amendment is to authorize the Regional Directors to accept the reports that this Part requires to be made on FAA forms, in other equivalent formats. The owners of some facilities approved under this Part make out reports, containing all the information required on the FAA forms, in formats that facilitate machine processing. There is no reason why a report should not be accepted by FAA in such a format if it is equivalent to the FAA form both in contents and in convenience with respect to FAA processing.

In consideration of the foregoing, FAR Part 171 (14 CFR Part 171) is amended by adding, in Subpart F—General, new section 171.73.

This amendment is made on the authority of secs. 305, 307, 313(a), 601, and 606 of the Federal Aviation Act of 1958, as amended (49 U.S.C. 1346, 1348, 1354(a), 1421, 1426). Since it relaxes existing requirements and does not put a burden on any person, notice and public procedure thereon are not required and the amendment may be made effective upon publication.

Amendment 171–4

True Light Certificates

Adopted: August 28, 1968 **Effective: September 5, 1968**

(Published in 33 F.R. 12544, September 5, 1968)

The purpose of this amendment to Parts 151 and 171 of the Federal Aviation Regulations is to generally discontinue the issuance of Certificates of "Lawful Authority to Operate a True Light" (True Light Certificates), under § 171.61; to revoke most of those Certificates, to terminate most pending applications for those Certificates; to delete the requirement that certain Federal-aid Airport Program sponsors apply for those Certificates, under § 151.87; and to ensure the acceptable operation of airport lighting in new § 151.86.

This amendment was proposed in Notice 68–12 that was issued on May 15, 1968, and published in the Federal Register on May 22, 1968 (33 F.R. 7582). The comments received in response to the Notice either generally agreed or expressed no objection to the amendments proposed. In the light of the comments received, the FAA is adopting the amendments as proposed in Notice 68–12, for the reasons stated therein.

As amended, the FAA no longer issues, or accepts an application for, a "True Light Certificate" under Part 171. New § 171.61(a) generally revokes each "True Light Certificate", and terminates each application for a Certificate. An exception in new § 171.61(b) preserves the Certificate or application of a Federal-aid Airport Program sponsor that was required to apply for a "True Light Certificate"

justifies the investment of Program funds." Under new § 151.86(d), these new provisions apply to the sponsor of an "airport lighting" project that has not entered into a grant agreement on the effective date of this amendment (whether or not it has applied for a "True Light Certificate"). As stated above, if a sponsor's Certificate or application is preserved under § 171.61(b), it may agree to comply with § 151.86(b)(3) and surrender its Certificate or terminate its application under § 151.86(e).

As stated in Notice 68–12 new §§ 151.86(a) and 151.86(b) reflect the provisions in present §§ 151.87(a) and 151.87(b), which are being deleted. New § 151.86(a) also reflects the fact that the Administrator may find that airport lighting is necessary under § 151.13. Editorial changes to §§ 151.87(c), 151.87(d), 151.87(h), 151.87(k) and Appendix F of Part 151 are also adopted as proposed in Notice 68–12.

In addition to the amendments proposed in Notice 68–12, the FAA is adopting a clarifying amendment to § 151.111(c)(2). In Amdt. 151–22, the FAA amended § 151.111(c)(2) to refer to a new publication that identifies large and medium hubs served by scheduled air carrier service. No change was made in the substance of § 151.111(c)(2), and an airport that would be eligible under the former language of paragraph (c) continues to be eligible under that paragraph as changed by Amdt. 151–22. However, the new language of § 151.111(c)(2) may be misunderstood to mean that, if any airport in a large or medium hub is served by scheduled air carrier service, then every other airport in that hub is excluded. Since the FAA does not intend this construction, § 151.111(c)(2) is clarified to make that fact clear.

Since this amendment relates to public grants and eliminates an unnecessary procedure, I find that good cause exists to make this amendment effective in less than 30 days.

In consideration of the foregoing, effective September 5, 1988, Parts 151 and 171 of the Federal Aviation Regulations are amended.

This amendment is made under the Federal Airport Act, as amended (49 U.S.C. 1101–1120), and sections 307, 313(a), 601, and 606 of the Federal Aviation Act of 1958 (49 U.S.C. 1348, 1354(a), 1421, and 1426).

Amendment 171–5

Revocation of Notice Form

Adopted: September 22, 1969 **Effective: September 30, 1969**

(Published in 34 F.R. 15244, September 30, 1969)

The purpose of this amendment to Part 171 of the Federal Aviation Regulations is to revoke § 171.13(d) and § 171.53(d), and to delete a reference to an FAA Form number in § 171.73.

Sections 171.13(d) and 171.53(d) require owners of nonfederal navigation facilities to file reports on FAA Form 3092 of each equipment failure that removes the facility from service. Reference to this form is made in § 171.73.

In the past, this form was used to develop statistical information, reliability standards and other relevant data for nonfederal navigation aids. Inasmuch as FAA Form 406c, Facility Maintenance Log, is a record of all equipment malfunctioning, a determination has been made that the data provided by FAA Form 3092 is no longer required.

Since this amendment eliminates a procedural requirement and further reduces a burden on the public, compliance with notice and public procedure thereon is unnecessary and it may be made effective in less than 30 days.

In consideration of the foregoing, Part 171 of the Federal Aviation Regulations is amended, effective September 30, 1969.

(Published in 35 F.R. 10288, June 24, 1970)

The purpose of these amendments to Part 171 is to eliminate the requirement that a sponsor of a non-Federal navigation facility must pay all the costs of any flight or ground inspections made before the facility is commissioned, and to provide the conditions under which these costs may be borne by the Federal Aviation Administration.

These amendments also make discretionary with the Administrator of the Federal Aviation Administration whether a standby system will be required for localizer, glide slope and monitor accessories to supplement the primary system, unless primary power is supplied from at least two independent sources, and whether a facility will be required to have dual transmitting equipment with automatic changeover for localizer and glide slope components.

These amendments are based on a Notice of Proposed Rule Making (Notice No. 69–43) published in the Federal Register on October 18, 1869. Two comments were received and both were favorable.

Both commentators suggested that the FAA be specific as to which facilities would be required to have standby power and dual transmitting systems, either by stating the conditions whereby such equipment would be required, or by requiring such equipment at airports involving airline operations. To do so, the FAA would have to establish general rules based on basic minimums and density of air traffic criteria for all potential sponsors under Part 171. The FAA does not believe that satisfactory criteria in this regard can be established. Even if such criteria could be established, any final determination would be contingent on FAA ground and flight inspection of the location and equipment concerned. The deletion of the mandatory requirements for backup power and transmitting systems is designed to give the FAA discretion to require such equipment only where it is deemed necessary in the interest of aviation safety. The need for such equipment can be best made on a case by case basis whereby the individual requirements of the location in question can be assessed. Additionally, all ground communication requirements will also be decided on a case by case basis.

It is the intent of the FAA in these changes and other requirements in Part 171 to require non-Federal Navigation Facilities to meet and be maintained at the same standards as FAA facilities.

In consideration of the foregoing, Part 171 of the Federal Aviation Regulations is amended, effective July 24, 1970.

These amendments are made under the authority of Sections 305, 307, 313(a), 601, and 606 of the Federal Aviation Act of 1958 (49 U.S.C. 1346, 1348, 1334(a), 1421, and 1426), and of Section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)).

Amendment 171–7

Simplified Directional Facility, Distance Measuring Equipment, and VHF Marker Beacons

Adopted: August 4, 1970 **Effective: September 9, 1970**

(Published in 35 F.R. 12709, August 11, 1970)

The purpose of this amendment to Part 171 of the Federal Aviation Regulations is to establish minimum requirements for the approval and operation of simplified directional facilities (SDF), distance measuring equipment (DME), and VHF marker beacons, and to make certain other minor revisions in that Part. The amendments were proposed in Notice No. 70–6 issued on January 29, 1970, and published in the Federal Register on February 4, 1970 (35 F.R. 2528).

Comments were received from 52 sources, including individuals, trade associations, and Governmental bodies. Twenty-eight of these comments were received from a manufacturer of SDF equipment. Numerous

basis exists for ensuring that Federal facilities, in the National interest, are given high priority. However, this policy is the responsibility of the Federal Communications Commission, not the Federal Aviation Administration, and is not altered by this amendment.

With respect to inequities in funding policy, the Federal Aviation Administration believes that there may be a misunderstanding of FAA policy. As stated in Amendment 171–6, published in the Federal Register on June 24, 1970 (35 F.R. 10288), the FAA has relaxed the total prohibition on Federal funding of ground and flight inspections, and will now provide funds therefor when consistent with budgetary requirements and related necessary policies of the Administrator. This policy is repeated in this Amendment (§ 171.105(a)(7)). In any case, this amendment does not introduce any new FAA funding policy contrary to the interests of sponsors of non-Federal navigation aids.

In response to one comment, § 171.105(b) is clarified to make it clear that the facility in question will be licensed by the Federal Communications Commission. The license will give the operator authority to transmit on the assigned frequency until it expires, normally a period of 5 years, or until it is cancelled. The Federal Communications Commission will cancel or revoke a license only for certain reasons. It does, however, consider Federal Aviation Administration recommendations for short term licenses, and has agreed to consider recommendations for nonrenewal of licenses for facilities which provide limited public service. This wording of § 171.105(b) is therefore changed accordingly.

As a result of internal recommendations, it has been decided to change the designation of the facility in Subpart F from Simplified Directional Approach System (SDAS) to Simplified Directional Facility (SDF).

One comment questioned the criteria contained in § 171.103(a)(5) and (b) as to inspection and evaluation of the facility, expressing the opinion that the criteria should apply only to the initial unit certified by a given manufacturer, and once accepted into the system that there should be no requirement for repeating the process for each identical facility.

It is the position of the Federal Aviation Administration that the 800-hour mean time between failure (MTBF) standard and in-service evaluation should apply to all SDF facilities to be installed subsequent to approval of SDF by the Systems Research and Development Service. It does not appear reasonable to assume that an evaluation of one facility at one particular location will necessarily satisfy the evaluation requirements of another facility at a different location. However, § 171.103(a)(5) provides that previous equivalent operational experience with a facility with identical design and operational characteristics will be considered in showing compliance with the provisions of that subparagraph.

This commentator also urged that the nominal course sector width (§ 171.109(a)(9)) be maintained at 6° if possible. In response to this, the Federal Aviation Administration points out that a width of 12° would not be approved (and a width of 6° would be used) unless there is assurance that it will provide satisfactory service. The commentator further correctly noted that § 171.111 (g) and (h) as written, were inconsistent with the provisions of § 171.109(a)(8). This inconsistency has been resolved.

In addressing Subpart H, the commentator observed that an instrument approach procedure cannot be established on a VHF Marker Beacon which is a secondary facility to be used only in conjunction with another type of radio facility which provides course information. The Federal Aviation Administration agrees with this comment and appropriate changes have been made.

Three commentators expressed concern that approval of SDF would result in a "lowering of standards" and a struggle to acquire and retain scarce frequencies. The operational adequacy of the SDF will be determined by appropriate ground and flight inspection criteria. Approval of an IFR procedure for a particular location which will utilize an SDF will have to be determined on a location by location basis. This is the same procedure currently used for approval of an IFR procedure for any type of navigation aid. After careful review of the total combination of operating and approval criteria in this amendment, the Federal Aviation Administration is confident that no lowering of operational safety levels will result from this amendment.

determinations of reliability, the Federal Aviation Administration believes that reliability requirements for newly developed equipment installed subsequent to being approved for use in the National Airspace System by the Systems Research and Development Service may be satisfied by any party having acceptable documentation of the facility. Loss of electrical power constitutes an equipment failure and, therefore, must be retained as part of the MTBF requirement. The Federal Aviation Administration region concerned will determine compliance with respect to requirements for numbers of inspections and periodicity of performance checks. The suitability of specific air/ground communications equipment will have to be determined on a case-by-case basis. Licensing requirements of course are determined by the Federal Communications Commission, not the Federal Aviation Administration.

In response to one comment concerning reporting requirements, it is the Federal Aviation Administration's position that reporting requirements under Part 171 have already been sufficiently relaxed and no further relaxation is anticipated.

In response to a comment concerning communications requirements in Subpart H, the Federal Aviation Administration believes that the factors affecting these requirements cannot be predicted in advance, and that such requirements should therefore be considered on a case-by-case basis, and should not, as requested, be identified and defined in advance of receipt of data from the sponsor.

In a detailed submission, one comment supported the subparts on DME and VHF Marker Beacons, but strongly opposed inclusion of standards for SDF. The commentator stated that the SDF is a degraded ILS system and that in view of the great effort, nationally and internationally, that has gone into developing standards for the ILS system, unacceptable to now degrade that long term standardization effort by adopting standards for a degraded ILS localizer without the accepted process of national selection or agreement. The comment also expressed concern with respect to the impact upon scarce ILS channel assignments since each SDF facility will require a localizer frequency. The commentator raised a question of reliability based upon one unfavorable report concerning one particular installation and upon the fact that no SDF system has yet been installed which meets the standards and requirements outlined in the amendment; and stated that performance information is lacking and should be known prior to consideration of the rule.

The Federal Aviation Administration does not believe that any of these concerns expressed by the commentators can be justified on their merits. The operational adequacy of the SDF will be determined by appropriate ground and flight inspection criteria that are fully adequate to ensure the safety of the operational use of the equipment. Approval of an IFR procedure on a location which will utilize an SDF is a matter to be determined on a location-by-location basis. This is the procedure currently used for approval of an IFR procedure for any type of navigational aid. Accordingly, if the SDF performs in accordance with the systems characteristics provided by SRDS and meets stability requirements, the Federal Aviation Administration is confident that no lowering of standards would result.

In regard to assigned frequencies, the Federal Aviation Administration does not anticipate any jeopardy of frequency assignment or retention because of the entry of SDF into the field. In addition to an SRDS evaluation of SDF performance, information will be determined by ground and flight inspection, and MTBF requirements will be satisfied on a site-by-site basis. With respect to a general comment on MTBF as a factor, the Federal Aviation Administration, in view of the many varying types of operational requirements, does not believe the levying of an availability requirement is the most feasible or economical way to obtain the results this factor provides for. An MTBF for all facilities encompassed in Part 171 will be provided as it becomes available.

One comment generally endorsed the amendment, but expressed concern over the ability of at least one type of SDF system to meet the stated requirements, particularly with regard to the tolerances for vertical polarization. It is expected that some manufacturers of SDF equipment may have to modify or improve their equipment to meet the vertical polarization tolerances specified in the amendment. The tolerance limit set out is adequate for approach aids, and experience has shown that with proper care, radiated signals can be maintained within the specified limits.

—course structure;

—power output;

—VSWR;

—requirements for course alignment;

—clearance;

—modulation monitor limits;

—standby power for the SDF.

These suggested changes have been incorporated into the final rule.

The Federal Aviation Administration did not agree with the changes suggested in the remainder of this commentator's suggestions. The more significant of these are treated in the following discussion.

With respect to the approval of new facility types, the commentator objected to the procedures involved. In this regard, the Federal Aviation Administration believes that any new facility type should be approved by SRDS prior to receiving any consideration for having the facility concerned approved for IFR use. Upon SRDS approval of a new facility, any potential sponsor of an SRDS approved facility may request approval of an IFR approach procedure using such a facility. The Federal Aviation Administration region concerned will then respond to a potential sponsor's request for an IFR procedure by initiating action to evaluate the facility for a required period (normally 30 days) for the location concerned. This Federal Aviation Administration regional evaluation will be required for all subsequent locations utilizing identical facilities. The commentator assumed in one comment that the MTBF requirement need only be met once. This is not correct. An 800-hour MTBF will be required for all such facilities requesting an IFR procedure. This is not a one-time approval requirement and the commentator's suggested certification procedure would not, in the Federal Aviation Administration's opinion, achieve the same result. Furthermore, the period of in-service evaluation will be determined by the Federal Aviation Administration region in which the facility is installed, as proposed in the Notice.

With respect to comments concerning relaxation of the vertical polarization requirement, the Federal Aviation Administration believes that a vertical polarization limit of one-twentieth of the course sector width is necessary to insure that the undesired polarization component does not exceed the course structure limitations. Vertical polarization can reasonably be controlled and maintained within the limits specified, and in view of its substantial effect upon the pilot's ability to fly the desired course, the specified value is justified.

One comment requested a form of relaxed tolerance checks in certain parameters, including ground standards and tolerances. It is believed that the tolerance check criteria in this amendment are necessary for safety. This comment cannot, therefore, be accepted.

Interested persons have been afforded an opportunity to participate in the making of these amendments. Due consideration has been given to all matter presented. In other respects, for the reasons stated in the preamble to the notice, the rule is adopted as provided herein.

In consideration of the foregoing, Part 171 of the Federal Aviation Regulations, is amended, effective September 9, 1970.

These amendments are made under the authority of Sections 305, 307, 313(a), 601, and 606 of the Federal Aviation Act of 1958 (49 U.S.C. 1346, 1348, 1354(a), 1421, 1426), and Section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)).

Since this amendment is procedural in nature and imposes no burden on the public, I find that public notice and procedure thereon are not necessary and that it may become effective in less than 30 days.

In consideration of the foregoing, § 171.71 of the Federal Aviation Regulations is amended, effective April 24, 1971.

(Section 313(a) of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a); Section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c) ; and Section 1.4(b)(1) of the Regulations of the Office of the Secretary of Transportation.)

Amendment 171–9

Performance Requirements for VOR, ILS, and SDF Facilities

Adopted: October 3, 1973 **Effective: November 19, 1973**

(Published in 38 F.R. 28557, October 15, 1973)

The purpose of these amendments to Part 171 of the Federal Aviation Regulations is to revise certain performance requirements for non-Federal very high frequency omni-directional radio (VOR), instrument landing systems (ILS), and simplified directional facilities (SDF).

This amendment is based on a Notice of Proposed Rule Making (Notice No. 73–9) issued March 14, 1973, and published in the Federal Register on March 21, 1973 (38 F.R. 7401). Interested persons have been afforded an opportunity to participate in the making of these amendments, and due consideration has been given to all comments received in response to that Notice.

Notice 73–9 stated that the FAA had determined that future requirements for air navigation aids in the National Airspace System could not be met with the number of frequencies now available for assignment, and that examination of alternative solutions to this problem indicated that reduction of radio channel spacing from the present 100 kHz spacing to 50 kHz spacing was the most economical and practicable method of increasing the number of assignable frequencies.

The Federal Communications Commission, at the request of the FAA, has amended Parts 2 and 87 of the FCC regulations (47 CFR 2, 87; 38 F.R. 14106, May 29, 1973) to provide for 50 kHz channel spacing in the frequency band 108–117.95 MHz. This amendment doubles the availability of assignable channels for VOR and ILS facilities.

As Indicated in Notice No. 73–9, implementation of 50 kHz channel spacing will require an increase of frequency stability for the ILS glide slope and localizer, SDF, and VOR ground transmitters. In order to provide for satisfactory adjacent-channel operations, the frequency tolerance of these transmitters must necessarily be reduced from the previous performance requirement of 0.005 percent to 0.002 percent. The FCC rules change cited above requires 0.002 percent frequency tolerance effective July 1, 1973. The FAA and Department of Defense (DOD) have accomplished frequency stabilization for federally-operated facilities.

The Notice proposed that operators of non-Federal VOR facilities be required to suppress subcarrier harmonics (to perform in accordance with paragraph 3.3.5.7 of Annex 10 to the Convention on International Civil Aviation) within 180 days after notification by the Administrator that 50 kHz channel spacing was to be implemented in the area and that a requirement existed for suppression of 9960 Hz subcarrier harmonics. While it was proposed that this requirement be made effective July 1, 1973, it was also anticipated that with the additional frequencies available for assignment, adjacent-channel interference could be avoided for some period of time and suppression of harmonics at non-Federal facilities could be avoided until 1975.

inadvertent mistuning condition. Additionally, FAA believes that the problem of mistuning an airborne receiver is most appropriately resolved by crew training and indoctrination, or by modification of airborne equipment. In this connection, FAA issued Advisory Circular 90–58, February 16, 1972, advising of the potential hazards of inadvertent mistuning of 50 kHz receivers.

With respect to the effective date for requiring harmonic suppression, the FAA believes that with the additional flexibility in frequency assignment afforded by 50 kHz channel spacing adjacent-channel interference from non-Federal facilities can be avoided for the immediate future. Accordingly, § 171.7(e) has been changed to provide for suppression of harmonics on non-Federal VOR facilities after January 1, 1975. VOR facilities operated by the United States (FAA and DOD) will have harmonics suppressed as necessary to avoid adjacent-channel interference.

These amendments are made under the authority of sections 305, 307, 313(a), 601, and 606 of the Federal Aviation Act of 1958 (49 U.S.C. 1346, 1348, 1354(a), 1421, and 1426), and section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)).

In consideration of the foregoing, Part 171 of the Federal Aviation Regulations is amended effective November 19, 1973.

Amendment 171–10

Interim Standard Microwave Landing System

Adopted: August 12, 1975 **Effective: August 19, 1975**

(Published in 40 F.R. 36109, August 19, 1975)

The purpose of this amendment to Part 171 of the Federal Aviation Regulations is to adopt a new Subpart I prescribing procedures for the approval, installation, operation, and maintenance of an interim standard microwave landing system (ISMLS).

Interested persons have been afforded an opportunity to participate in the making of this amendment by a notice of proposed rule making, published in the Federal Register on November 8, 1974, (Notice No. 74–34, 39 F.R. 39565), and due consideration has been given to all comments received in response to the Notice. Except as specifically discussed herein, this amendment and the reasons therefor are the same as those proposed in the Notice.

Eighteen public comments were received in response to the Notice, and all but three voiced unqualified support for the adoption of the ISMLS as proposed. Common to the objections of those commentators opposed to the proposals in the Notice was the belief that adoption of an ISMLS would be in conflict with, or jeopardize, the implementation of a final and universal microwave landing system (MLS). In voicing this concern, one commentator contended that the proposed signal format for the ISMLS could ultimately conflict with the final MLS thereby delaying its implementation. In response to this concern for an apparent conflict between the ISMLS and the final MLS, the FAA reiterates its position that development of the MLS is an on-going commitment of the FAA to implement a universal microwave landing system, and is being developed entirely separate from the ISMLS project.

As noted in previous FAA announcements and notices concerning this subject, the ISMLS is designed to meet the temporary need for an instrument approach system where installation of current systems would be unfeasible. Allowing time for final selection and testing, as well as international adoption, the implementation of a final MLS may be as much as three to four years away. Consequently, the ISMLS should fill an operational need for a period of time sufficient to warrant its adoption. Upon implementation of the final MLS, system approval of additional ISMLS would cease. Thus, the two

obligations under section 14(b) of the Airport and Airway Development Act of 1970 (84 Stat. 224), as amended, terminated on June 30, 1975. Furthermore, a continuation of ADAP program will require Congressional action, and ADAP legislation proposed by the Department of Transportation would exclude electronic navigation aids such as the ISMLS from the ADAP program. While it cannot, at this time be determined what if any ADAP program will be authorized by Congress, persons considering the installation of an ISMLS are advised that Federal participation must not be assumed.

With regard to the question of system costs, it is important to consider more than the "off-the-shelf" costs of the equipment itself. Because the ISMLS will provide maximum benefit in areas where local geography makes use of a current system unfeasible, site preparation costs, which generally will be lower for the ISMLS, must be considered as well as equipment costs. Furthermore, by providing for use of a converter to the airborne ILS receiver, avionic costs can be held to a minimum.

In response to the statement in the Notice that systems other than the one proposed may be approved if they meet the proposed operational requirements, one commentator stated that this should mean that advance versions of the ultimate U.S. selection for an MLS should be approved, and given preference over the proposed ISMLS. In addition, the commentator stated that the ISMLS should not be eligible for Federal funding. The FAA does not agree with this comment because it assumes that competing systems for ultimate MLS selection are in the final development stage and ready to serve the interim need the FAA has determined exists. Therefore, in light of the interim need, the FAA has determined that a provisional ISMLS system is necessary, and will not impede implementation of the MLS program.

One commentator recommended that if the proposed ISMLS is to be adopted, it be considered a Federal NAVAID and thus not be placed in Part 171 as a non-Federal navigation facility, thereby permitting certification of other ISMLS under Part 171. The FAA has determined that the ISMLS proposed in the Notice should be adopted in Part 171 as a non-Federal navigation facility because of its intended short term existence in the national navigation facility system thereby rendering full Federal control as a Federal NAVAID impractical. With regard to the approval of an ISMLS other than the system proposed in the Notice, adoption of the proposed ISMLS in Part 171 will not prevent other systems, capable of meeting the operational requirements thereof, from being approved.

For the same reason, the FAA does not agree with the comment which asserted that the signal format of the proposed ISMLS should be considered a technical specification for the Tull system only and thus not apply to other systems for which approval may be sought. That approach would in effect overlook the efforts expended thus far in the development of the ISMLS and would leave the FAA without a definite standard against which to measure the adequacy of various systems which may, in the future. seek approval.

Another comment addressed to the overall value of the proposed ISMLS, recommended that the guidance system of the ISMLS be at least as good as that required in the United States for ILS service, and not be based upon minimum requirements existing outside of the U.S. which may be less stringent. In this regard, the commentator cited the proposed below path glide path clearance signal requirements as being substantially less stringent than similar current requirements. In selecting standards for the below path clearance signal, the FAA has chosen those prescribed in Subpart C of Part 171 because the FAA believes that those standards ensure safe operations and provide familiar criteria.

The same commentator questioned the reference in proposed § 171.267(a)(5) to ICAO Document 8186–OPS/611 concerning guidance on obstacle clearance criteria. After reviewing that document in light of the comment, the FAA agrees that the criteria set forth in Subpart C of Part 97 (TERPS), is more appropriate, and that section has been changed accordingly.

In response to comments concerning the licensing procedure, whereby Tull Aviation will grant licenses in their ISMLS technical data as well as for the manufacture of equipment, it should be noted that at the time the FAA requested manufacturers to submit bids for the ISMLS, all participants were notified that one requirement would be an agreement to provide licenses in technical data and to certain manufacturing rights. One of the major considerations of the FAA in developing an ISMLS was whether or not

The FAA proposed, and adopts herein, the use of those terms which the agency has determined correctly describe or define an operational requirement, regardless of whether or not the term is new or is carried over from current instrument systems such as ILS. With specific reference to use of the term DD, difference in depth of modulation, that term is carried over from ILS inasmuch as the ISMLS uses existing ILS airborne receivers, and the ISMLS converter will produce the equivalent of 90 Hz and 150 Hz modulated signals, even though the radio frequency carrier on the ground will not be radiating ILS 90 Hz and 150 Hz tones.

Finally, one commentator stated that the proposed ISMLS does not meet the growing need for IFR VTOL operations because it is not suited to the physical environment found around the majority of center-city heliports. As noted previously, one of the needs the ISMLS is intended to meet is the need for an instrument approach system where current systems are unfeasible due to terrain factors. While the ISMLS was not intended to serve center-city heliports primarily, it can, upon approval by the FAA, increase the radiated glide path from the 3 degrees currently provided by ILS, up to 9 degrees.

In addition to the broad comments discussed above, three comments were received which dealt with specific operational requirements of the system.

One commentator recommended that use of the Morse Code signal for the letter ''M'' for the localizer identification signal, be changed to avoid possible misinterpretation under adverse audio conditions. The commentator notes that the Morse Code signal for ''M'' is similar to the signal for the ILS identifier ''I'', and that the two identifiers would be generally received on the same audio selector/volume control in the aircraft. To prevent an identification signal conflict between ISMLS and ILS, the commentator recommended that the identifier be substantially different from the ILS ''I'', and have at least three or four tone pulses in the first letter, such as the letter ''X''. While the FAA agrees that a identification signal conflict is possible, the agency does not believe that it is necessary to change the identifier ''M'' to correct the problem. Adequate protection can be provided by using different identification call signs at those airports where both an, ILS and an ISMLS are in operation. This approach is consistent with current procedures applicable to airports where more than one electronic navigation aid is in operation.

Another commentator recommended that provision be made for a collocated localizer antenna system for airports where a split-site system is not practical due to land acquisition restraints. The FAA agrees that it is necessary to permit collocated systems, and made provision for them in § 171.261(b). Normal configuration is a split-site system, however, collocated antennae may be allowed in accordance with the criteria prescribed in Subpart C of Part 97 (TERPS).

Finally, a comment questioned the use of an airborne signal converter and its certification by the FAA, in that such certification would be unprecedented and not in the best interest of general aviation users. The authorization of the ISMLS airborne converter (through the TSO procedure, which is now in process) is based upon current FAA procedures for the authorization of airborne equipment, as for example, in the case of the basic ILS airborne receiver, and consequently is appropriate in this case.

The following statements concerning patents and licenses, which appeared in the preamble to the Notice, are incorporated herein:

1. In selecting the ISMLS proposed by Tull, the FAA has concluded an agreement whereby Tull has agreed to grant royalty-free licenses in their technical data for the manufacture, sale, and use of the Tull system only within the United States, its territories and possessions, the District of Columbia, Puerto Rico, and the Canal Zone. Licensees of only the technical data will be required to indemnify purchasers and users of equipment manufactured by the licensee from this data against liability from patent infringement arising from the manufacture or sale of the ISMLS. The data will be available to licensees from Tull for the cost of reproduction and handling.

2. The FAA takes no position on the scope, coverage, or validity of the patents claimed by Tull for its system, nor on any patents that may result from any pending applications.

and to provide a clearer format.

Since this amendment is enabling in nature in that it will permit the installation of a new non-Federal navigation facility, thereby relieving an existing restriction, I find that good cause exists for making it effective on less than 30 day's notice.

These amendments are made under the authority of sections 305, 307, 313(a), 601, and 606 of the Federal Aviation Act of 1958 (49 U.S.C. 1346, 1348, 1354(a), 1421 and 1426), and section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)).

In consideration of the foregoing, Part 171 of the Federal Aviation Regulations, is amended, effective August 19, 1975.

Amendment 171–11

Microwave Landing System Requirements for Non-Federal Navigational Facilities

Adopted: November 3, 1981 **Effective: December 17, 1981**

(Published in 46 FR 61560, December 17, 1981)

SUMMARY: This amendment establishes minimum standards and procedures for the approval, installation, operation, and maintenance of a Microwave Landing System (MLS) facility that is not operated and maintained by the FAA or other Federal agency. MLS is a system designed to take the place of the Instrument Landing System (ILS) used at commercial airports in the United States and around the world since 1945. MLS is projected to meet both civil and military requirements for the foreseeable future and to provide more flexibility in terminal area operations, abate noise, and be cost effective. MLS has been selected for standardization by the International Civil Aviation Organization (ICAO) for eventual installation at terminal areas of member States. The aviation community recognized the need for a new system to fulfill future requirements. MLS has been chosen to satisfy this need. Since these facilities may be operated and maintained by persons other than the FAA, the requisite standards and procedures to operate these facilities in the National Airspace System (NAS) must be provided in the form of a regulation to govern those activities. This amendment is consistent with the requirements of Executive Order 12291.

FOR FURTHER INFORMATION CONTACT: Mr. Sotires P. Mantis, Airway Facilities Service, (AAF–720), Airway Systems Division, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, D.C. 20591; telephone (202) 426–3008.

SUPPLEMENTARY INFORMATION:

Background

This rule is based on Notice of Proposed Rulemaking (NPRM), Notice 80–15, Non-Federal Navigation Facilities; Proposed Microwave Landing System Requirements (45 FR 59256) published in the Federal Register September 8, 1980. All interested persons have been given an opportunity to participate in the making of this rule and due consideration has been given to all information submitted.

The search for an adequate successor to the present ILS has been underway for several decades. ILS was adopted for national service in 1941 and has been installed at approximately 700 locations in the United States. ILS is also the international standard and as such is installed in many other locations worldwide. Although significant improvements in system design have been made since it entered service, ILS is basically the creation of an older technology which limits its utility in some applications and falls short of meeting the full range of operational requirements as now defined nationally and internationally.

system proposed for international adoption. In April 1978 ICAO selected the TRSB MLS for international standardization.

It should be noted that an interim standard microwave landing system (ISMLS) was adopted in 1975 for use at locations where a VHF/UHF ILS would not perform in an effective manner, or where the need for a low approach service would be better served by the use of the ISMLS. This system was intended as an adjunct to the ILS system and was considered necessary to fulfill some immediate aviation growth needs during a transition period. That transition period was the time necessary to develop an MLS which meets international standards.

Need for the Regulation

This regulation makes provision for approval of an instrument approach procedure using an MLS not provided by the Federal Government, which will satisfy the needs of various operators. Among these are operators who desire an instrument approach procedure but do not for Federally provided equipment; operators who qualify for Federally provided equipment but prefer an MLS to an ILS; operators with locations on which the ILS cannot be properly sited; and operators who desire immediate installation of an MLS system without having to wait for the installation of a Federal system.

In the next one to three years the FAA expects no more than ten facilities to be installed and five to ten per year thereafter. These numbers, however, are estimates since there is no way of identifying the requirements for privately funded facilities. The numbers will vary depending upon manufacturer prices and consumer needs.

There are no current FAA MLS facilities; however, FAA is preparing Federal specifications to proceed with a procurement of approximately 95 systems beginning in 1983. The FAA has programmed for the installation of over one thousand systems by the year 2000.

The MLS system proposed herein provides for a ±10° approach sector and a continuum of glideslopes consistent with a minimum vertical proportional guidance sector of 0.9° to 7.5° This minimal system does not preclude the use of additional units to produce a system with a wider approach sector, steeper glidepaths, a back azimuth capability, precision DME, or the use of redundant units to maximize system availability. While the MLS specified in this proposal is the minimum system which would be approved for use in an IFR procedure, the provisions of this proposed subpart are not intended to prevent the selection of an MLS system which has increased performance characteristics, as long as the system selected performs in accordance with the standards now in process of publication by ICAO. A finding of no significant environmental impact can be found in the public docket for this rulemaking action.

Relationship to International Standards

Subsequent to the ICAO selection of an MLS in 1978, the process of creating and adopting international Standards and Recommended Practices (SARPS) has proceeded. The basic SARPS, which will assure interoperability between ground and airborne equipments, was approved for inclusion in Annex 10 to the Convention of International Civil Aviation at the divisional meeting in April 1981 at Montreal. All ground systems must be interoperable with regard to channeling, signal format, timing, and performance accuracy. This includes non-Federal, Federal, and International systems. The United States, as a member of ICAO comprising 148 member states, has contributed to the standardization of precision landing systems to insure interoperability worldwide. Both the FAR and the FAA procurement specifications will be identical with respect to interoperability and performance requirements, both of which conform to the ICAO SARPS.

General

This amendment adds a new subpart to Part 171 of the Federal Aviation Regulations to provide requirements for a non-Federal MLS facility. This rule sets forth minimum requirements that must be met before the FAA authorizes instrument flight rule approaches to the airport and air traffic control

the installation and operation of the MLS. The regulations of the FCC applicable to radio frequency allocations and use are found in Parts 2 and 87 of Title 47 of the Code of Federal Regulations.

As part of the requirements, the FAA also incorporates by reference several technical documents in accordance with 5 USC 552. The following documents are available for inspection in accordance with § 171.71, and also at the Office of the Federal Register Information Center, Room 8301, 1100 L Street, N.W., Washington, D.C. 20408, and may be purchased from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161: FAA Handbook 8260.3, through change 3 dated June 3, 1980, United States Standard for Terminal Instrument Procedures (TERPS), and FAA Handbook AOP 8200.1, through change 35, dated May 15, 1981, United States Standard Flight Inspection Manual.

In addition, the following publication of ICAO is available from ICAO, Aviation Building, 1080 University Street, Montreal 101, Quebec, Canada, Attention: Distribution Officer; International Standards and Recommended Practices, Aeronautical Telecommunications, Volume 1 of Annex 10 to ICAO, through amendment 61 dated April 10, 1980. This incorporated material is not subject to frequent change. Readers, however, should contact the FAA to assure that they are consulting the current edition. This incorporation by reference was approved by the Director of the Federal Register on October 20, 1981.

Discussion of Comments

Forty-five comments were received in response to Notice 80–15. These represent views from a broad cross section of user groups including airport operators, state and county aviation authorities, pilot and airline associations, commuter airlines, manufacturers and others. The majority of the comments received supported the rule as proposed.

One commenter states that the implementation of non-Federal MLS at this time is "premature" and recommends that the rule be deferred until after implementation of the national MLS program. The FAA concludes an immediate requirement exists for a non-Federal MLS program. At the MLS public hearings in January 1981, there was an overwhelming positive response to rapid transition to MLS in both the Federal and non-Federal areas. This view is supported by a positive response to the proposed rule from the many segments of the aviation community.

One commenter states that the proposed rule, as written, would not encourage rapid and widespread implementation of non-Federal MLS. This was based on the assessment that the specified system accuracy and volumetric coverage requirements were excessive and, in their view, favored larger airports. The FAA does not agree. The rule specifies requirements for a minimum capability, single accuracy system as defined by ICAO and should prove beneficial at all airports, large or small.

Several commenters state that the requirements of specification FAA–G–2100, incorporated by reference in various sections of the rule, which provides general equipment requirements, and governs quality control, type testing, reliability and maintainability, establishes environmental requirements, and identifies component selection parts lists, are excessive. They contend that the specification levies reliability and maintainability requirements which are inappropriate for non-Federal application and the inclusion of FAA–G–2100 would have a negative cost impact on the program. After further analysis, the FAA concurs that the inclusion of FAA–G–2100 would increase the initial cost of a non-Federal MLS; therefore all reference to FAA–G–2100 is deleted from the rule, however, the requirement to design for high reliability and maintainability remains in § 171.323. These requirements provide for system integrity.

One commenter concludes MLS is not ready for implementation since no FAA (Federal) MLS system exists. The FAA recognizes the need for implementation of Federal MLS where needs and justifications are provided; however, this rule provides the public a means to establish an MLS without Federal justification. Since the public is soliciting for MLS at this time, the FAA is providing for non-Federal MLS standards consistent with ICAO recommendations. Further, the FAA is currently preparing Federal specifications in conformance with ICAO, resulting in a compatible interface between Federal and non-Federal MLS.

One commenter objected to the stated definition of "mean time between failures" and submitted a revised definition. The revised definition submitted defines "mean time between outages." After analysis, the FAA concludes that the use of the phrase "mean time between failures" is correct but that a definition is needed for the word "failure" to avoid misinterpretation of the meaning of that word.

Another commenter states that the definition of "minimum glidepath" is ambiguous and it is not clear whether the word consistent as used in the definition means the highest angle or the lowest angle. The FAA concludes that the definition conforms to the definition given in the SARPS and is not ambiguous. (The term "SARPS" is used herein to describe the provisions agreed upon by ICAO at the April 1981 meeting in Montreal, concurred in by the FAA.)

Additionally, the FAA adds to the rule a definition for "beamwidth," and revises the definitions of "MLS approach reference datum," "MLS back azimuth reference datum," "data rate," and "path following error" to make these definitions consistent with ICAO standards. The definition for "clearance guidance sector" is revised to be consistent with the use of the terms "fly-left/fly-right clearance" as used in § 171.311(i)(2)(iv) and Figure 8.

Section 171.305 Requests for IFR procedure.

That section lists the requirements for each person who requests an IFR procedure based on an MLS facility which that person owns. The required information includes a description of the facility and shows that the equipment meets specified performance requirements; a proposed procedure for operating the facility; a proposed maintenance organization and manual; a statement of intent to meet the requirements of the subpart, and a demonstration that the MLS facility has an acceptable level of operational reliability and maintainability. A provision also specifies the procedures to be followed after the FAA inspects and evaluates the facility. No comments were received on these requirements and the rule is adopted without change.

Section 171.307 Minimum requirements for approval.

That section prescribes the minimum requirements that must be met before the FAA approves an IFR procedure for an MLS facility. Those requirements relate to performance, installation, operation, maintenance, operational records, inspection, withdrawal from service, and costs.

One commenter suggests that the FAA should bear all costs of FAA-required normal flight and ground inspections. This suggestion is not accepted since the requirement as written in the rule reflects existing FAA policy; furthermore, the systems proposed by this order are systems installed and maintained by the owner for his benefit at his own expense. As stated in the rule, the owner must bear all costs of installation and flight inspection prior to commissioning. The rule is adopted as proposed.

Section 171.309 General requirements.

That section describes the MLS as a precision approach and landing guidance system which provides position information and various ground to air data. It also states that the position information is provided in a wide coverage section and is determined by an azimuth angle measurement, an elevation angle measurement and a range (distance) measurement.

An MLS constructed to meet the requirements of this subpart must include: approach azimuth equipment, associated monitor, remote control and indicator equipment; approach elevation equipment, associated monitor, remote control and indicator equipment; a means for the transmission of basic data words, associated monitor, remote control and indicator equipment; and distance measuring equipment (DME), associated monitor, remote control and indicator equipment. In addition, MLS may include as an option, back azimuth equipment, associated monitor, remote control and indicator equipment; a wider proportional guidance; precision DME, associated monitor, remote control and indicator equipment; and VHF marker beacons (75 MHz), associated monitor, remote control and indicator equipment. That section also prescribes environmental ambient conditions covering temperature, humidity, wind, hall, rain, and ice loading that

the azimuth equipment. The FAA disagrees. The order of the paragraphs as proposed does not inhibit the combining of functions where appropriate but provides clarity and this change is not accepted. monitor,

Another commenter asks whether or not DME remote control, and indicator equipment could be integrated with the MLS. After analysis of this comment, the FAA agrees that the equipment can be integrated. Therefore, the rule is changed in 171.309 (b) and (c) by including a note stating that this equipment may be integrated.

Another commenter requests a clearer definition of the capabilities of remote control and indicator equipment. Accordingly, a note is added to § 171.309(b)(4) setting the minimum requirements for the remote control and indicator equipment.

One commenter points out that § 171.309(c)(2), which provides for a wider proportional guidance sector, does not include the wider proportional guidance sector cited in § 171.317, Elevation performance requirements. An addition is made to § 171.309(c)(2) citing § 171.317.

Another commenter recommends that 15 degrees of proportional guidance be specified on the elevation equipment instead of 7.5 degrees. Since the SARPS specifies the minimum elevation proportional guidance as 7.5 degrees, proportional guidance above 7.5 degrees is optional, and the rule is adopted as proposed.

Several commenters object to the service and environmental conditions requirements as specified in § 171.309(d). One commenter states that the requirements are too restrictive and appear to be written for FAA procurement. Another commenter suggests specifying optional environmental requirements for different climatic conditions. Another commenter states that a reduced ambient temperature requirement would reduce costs and satisfy the requirements of most of the purchasers of the equipment. After considering these comments, the FAA concludes that a change in the service and environmental condition requirements would be inconsistent with standardized design concepts. Electronic equipment installed outdoors must conform to environmental standards regardless of geographical placement. A geographic boundary for climatic variations would be difficult to describe. For example, even though Florida would seem an inappropriate locale for the use of de-icers, there are occasions when de-icers would be necessary. The rule is adopted as proposed.

Several commenters object to the applicability of specification FAA–G–2100 as it relates to DME and markers. Clarification is made to § 171.309 which now describes DME and marker requirements separately in two paragraphs (e) and (f), respectively. It is made clear that when DME, or markers are components of MLS, they must conform to the requirements of FAR 171, Subpart G and H, respectively. All reference to Specification FAA–G–2100 is removed from this rule.

Additionally, in accordance with the requirements of SARPS, a change is made in § 171.309(b)(4). This change deletes the mandatory requirement for a marker beacon and a note is added which permits the use of a VHF marker beacon (75 MHz) in lieu of a DME at locations where the VHF marker beacon (75 MHz) is already located. Also §§ 171.309(c) (3) and (4) are added allowing as an option the use of a precision DME and marker beacon respectively. The rain requirements in § 171.309(d)(4) are restated for clarification since the proposed wording was confusing.

Section 171.311 Signal format requirements.

That section provides for signals radiated by the MLS which must conform to the signal format which describes sac minimum requirements such as frequency assignment, transmission rates and sequences, digital codes, and data modulation.

One commenter interprets § 171.311(a) Frequency Assignment to mean that all ground equipments must operate on more than one channel. This is not the intent. The ground components must operate on a single frequency assignment; however, the design of the ground equipment must allow for the capability to incorporate any one of the 200 listed channels with minimum adjustment. Accordingly the rule is changed to clarify this fact.

termination time. The FAA concurs and a note is added to Tables 2, 4a, 4b, 5, and 7 in § 171.311 explaining that when the "event time slot begins, the previous event time slot ends."

Another commenter recommends that the test pulses of the system test pulse requirements in § 171.311 should be artificially beam shaped. After reevaluation the system test pulse requirements are eliminated as the characteristics of the pulses have not been standardized; however, the time slot is retained.

One commenter suggests deleting the high rate approach azimuth function in § 171.311(f). The FAA concludes that this function has applicable system benefits. The rule is adopted as proposed.

Another commenter requests more information on the meaning of the phrase "undesirable flag action" in § 171.311(i)(2)(ii). After further evaluation the FAA concludes that this phrase is inappropriate and it is deleted. One commenter suggests clarification of the phrase "positive clockwise angles" in § 171.311(i)(2)(iii)(B) as it is ambiguous. The FAA concludes that this phrase is in common use and is widely understood. The rule is adopted as proposed.

One commenter suggests deleting the clearance function in § 171.311(i)(2)(iv) based on the premise that insufficient testing has been performed on this function. This commenter makes the same point again regarding § 171.313. The FAA concludes that the clearance function must be retained as a design option to be required at minimum capability installations where proportional guidance is provided to less than ±40 degrees in accordance with ICAO SARPS. A commenter also suggests that the width of the clearance pulse be equivalent to the scanning beam pulse (150 us) for a 3° beamwidth. This change is not acceptable since tests of the clearance signal resulted in the optimization of the clearance pulse width as stated. Another commenter states that it is inconsistent to the phrase "right clearance pulse/left clearance pulse" in the text of § 171.311(i)(2)(iv) and to use the phrase "fly-right clearance pulse/fly-left clearance pulse" in Figure 8 of § 171.311. The FAA concurs and the phrase "fly-right clearance pulse/fly-left clearance pulse" is inserted accordingly. Another commenter recommends deletion of the clearance function in § 171.311(i)(2)(iv) and replacing it with full proportional scan to that angle necessary to overcome erroneous signals which are generated at a particular site by causes such as multipath. The FAA concludes that deletion of the clearance function can optionally be permitted if the required approach guidance sector is provided by proportional guidance and adds a phrase so stating to that section.

Another commenter states that the data element in § 171.311(j)(3) requires ground equipments to do something which is not yet defined. This data element is undefined; however, a space in the timing sequence for the data element remains. In the future, the data transmission of the operational status of the equipment in use will be standardized and defined. A standard formats for this Basic Data Word requirement has not been formalized; however, this data word space must be available in the data timing for future use and definition.

One commenter states that the allowable range of the back azimuth distance in Basic Data Word Seven is not balanced against the allowable range of the approach azimuth to threshold distance in Basic Data Word One in § 171.311, Table 8. After further analysis, the FAA concludes that the 3,100 meter (10,000 feet) maximum permitted in Basic Data Word One is sufficient for this application.

Another commenter suggests the need for additional Basic Data regarding DME distance information. The FAA concurs and includes this information in Tables 3 and 8 of § 171.311 and §§ 171.311(j) (17), (18), and (19), as recommended by ICAO.

Additionally, § 171.311(c)(1) and Figure 1 of this section are changed so that the phase transition is made without amplitude modulation and the phase rate of change is consistent with the requirements of paragraph (d) of this section. This change makes the DPSK compatible with the receiver decoding tests chosen by the Radio Technical Committee on Aeronautics, Special Committee–139 (RTCA SC–139) for MLS receiver standards and as provided for by ICAO at the meeting in Montreal in April 1981.

One commenter states that there is no means to indicate to the airborne receiver whether the azimuth antenna coordinates are, as permitted in § 171.313(d), conical or planar. The small displacements between conical and planar beams in this sector are operationally acceptable and need not be identified. Further, highest capability users can obtain this information from auxiliary data transmissions, where provided. The rule is adopted as proposed.

One commenter states that a "fundamental problem" exists with including airborne error and ground system error with the specification of accuracy on a system basis in regard to Table 10 in § 171.313. Another commenter, with regard to Table 10, states that the CMN error accuracy requirement should be annotated "for information only" since it was only "a recommendation" in the SARPS. Beam stepping noise is controlled by the CMN value for the ground subsystem. The values stated in Table 10 limit the beam stepping noise of the ground equipment; therefore, it is a requirement rather than a recommendation. The system accuracy numbers give the equipment designer the information he needs on allowances for propagation errors. The rule is adopted as proposed.

One commenter suggests inclusion of the degradation allowance to the approach azimuth accuracy requirement. The FAA concurs and § 171.313(e) is modified to include the degradation allowance to make the rule consistent with the SARPS.

One commenter states that in § 171.313(a)(1) a reduction in the specified ±40 degree coverage sector when intervening obstacles prevent full coverage should be allowed. After further analysis, the FAA concurs. A reduction in the specified ±40 degree coverage sector must be permitted when full coverage is prevented by intervening obstacles. Therefore, a sentence is added to the end of § 171.313(a)(1) to so provide.

One commenter states that in § 171.313(a)(3) the proportional guidance requirements in the runway region do not allow for offset installations for a minimum system. The FAA concludes that this requirement should not apply to azimuth offset installations and, therefore, the statement, "This requirement does not apply to azimuth offset installations," is added to the rule.

One commenter states that in § 171.313(f)(1) the drift requirement for the approach azimuth antenna characteristics should be reduced and furthermore met without internal environmental control equipment. The FAA concludes that the given tolerances are adequate for system performance; however, the FAA agrees that the service conditions should be met without internal environmental control equipment to provide for maximum system availability and integrity and the rule is changed in § 171.313(f)(1) to so require.

One commenter suggests that in § 171.313(f)(2) the beam pointing error be defined, and another commenter states that drift and beam pointing error be deleted due to the inability to separate the two in actual field installations. After further evaluation, the FAA concludes that beam pointing error is defined in §§ 171.313(f) (1) and (2) as is the requirement that the measurement be made in a multipath free environment. Another commenter suggests that beam pointing error be deleted as it is overly restrictive. Beam pointing error cannot be deleted because it is needed to assure linearity of the azimuth guidance in the centerline region and acceptable PFE when flying orthogonal to the centerline; however, the required coverage within which the beam error applies is reduced from full coverage to ±0.5 degree of the zero degree azimuth.

Several commenters request that § 171.313(f)(3) on boresighting be expanded to include means other than only mechanical or optical for accomplishing the boresight procedure. The FAA concludes that electrical boresighting procedures can be utilized and the option for electrical boresighting is added to the rule. Another commenter requests that the antenna alignment tolerance in this section be relaxed. The FAA does not agree and the antenna alignment tolerance is adopted as proposed to insure system accuracies.

To specify effective radiated levels remove this ambiguity.

One commenter states that in § 171.313(g)(1) the minimum proportional guidance for back azimuth is omitted from the proposed rule. Also, that certain provisions are missing for siting the back azimuth. The FAA concurs and adds a provision for the minimum proportional guidance for back azimuth and provisions for siting the back azimuth in §§ 171.313(h) (1) through (6).

With reference to § 171.313(g)(4), one commenter states that the back azimuth power density levels are excessive, based on the reduced back azimuth range requirement. After further analysis, the FAA concludes that the minimum power densities required for back azimuth are consistent with the levels required in ICAO SARPS and are not excessive. Another commenter states that back azimuth coverage could be misinterpreted to mean that back azimuth must be provided at all facilities. The requirements for back azimuth in § 171.309 are clearly stated and should not be misinterpreted to mean that back azimuth must be provided in all facilities. The rule is adopted as proposed.

In addition a new § 171.313(f)(6) is added describing the radiation pattern of the data antenna. Also § 171.313(j) is expanded by adding back azimuth accuracy degradation allowances. These requirements were inadvertently omitted from the proposed rule and are now included to be consistent with ICAO SARPS.

Section 171.315 Azimuth monitor system requirements.

This section prescribes monitor systems that must provide an ''Executive Alert'' to the designated control points if any one of several conditions persist, such as an abnormal reduction in radiated power.

One commenter submits extensive revision to § 171.315 on azimuth monitor requirements. This proposal is not adopted as it is not necessary that the rule specify the arrangement of the monitor system. Another commenter describes the timing accuracy tolerance (reference Table 11) as unrealistic due to a 10μsec switching time. He further states that this requirement may also be difficult if not impossible to check during routine maintenance monitor checks. Table 11 specifies the timing tolerances for events internal to the transmitting equipment and is easily measured. The 10 microseconds referenced concern a rise time which occurs subsequent to the event time; therefore, the stated timing accuracy is a realistic requirement. This commenter also advises including degradation allowance in § 171.315(a)(1). The FAA concurs and degradation allowance is included in this section.

One commenter states that when referring to internal timing accuracies in Table 11 of § 171.315 that a specification should be included to indicate that the scan must be symmetrical about the mid scan point. The FAA concurs and adds Note 1 to Table 11 indicating that the tolerances shown therein apply to the timing of the specific events as shown in Tables 2, 4a, 4b, 5 and 7 of § 171.311.

Section 171.317 Approach elevation performance requirements.

The performance requirements for the elevation equipment components of the MLS included are requirements as to elevation coverage, siting, accuracy, and antenna coordinates and characteristics.

This section generated a number of comments. Many of the comments to § 171.313 were either repeated or are similar to the comments this section. Accordingly, the explanations given earlier are equally valid here and are not repeated.

One commenter states that the threshold crossing height (TCH) requirement of this section does not provide for STOL aircraft. After further analysis, the FAA concludes that elevation siting requirements for STOL operations should be included. Section 171.317(b)(2)(i) is added to the rule to include TCH requirements for STOL aircraft operations.

Several commenters suggest that elevation accuracy degradations of § 171.317(d)(1) be allowed to be consistent with ICAO SARPS. The FAA concurs. This section is changed so that degradation limits are included in the rule to conform to SARPS.

One commenter states that § 171.319(a) should include requirements that when multiple sensors are used to monitor a single parameter, at least two sensors must agree; The FAA disagrees. A monitor must insure integrity; however, it is left to the designer to incorporate specific design parameters. The rule is adopted as proposed.

One commenter suggests deletion in § 171.319(a)(1) of the phrase ''consistent with published approach procedures and obstacle clearance criteria.'' The FAA concurs that the deletion removes an undesirable restriction on monitoring and deletes the phrase.

Section 171.321 DME and marker performance requirements.

DME equipment must meet the performance requirements prescribed in Subpart G of this Part and marker beacon equipment must meet the performance requirements prescribed in Subpart H of this Part. Both subparts impose requirements that performance features must comply with International Standards and Recommended Practices, Aeronautical Telecommunications, Part I, to ICAO Annex 10.

One commenter suggests including the DME location and the zero range point in this section. After further consideration the FAA concurs and includes in this section the location of the DME and zero range point.

One commenter suggests that a reference to compass locators should be added to § 171.321. The FAA concludes that a compass locator is not part of an MLS and no changes are made in this section.

Section 171.323 Fabrication and installation requirements.

The MLS facility must be permanent in nature, located, and installed in accordance with best commercial engineering practices, and with applicable safety codes and Federal Communications Commission (FCC) licensing requirements. Suitable primary and secondary power sources must be provided. The facility must also have, or be supplemented by ground, air or landline communications services with the location of antenna centers and the runway centerline at threshold determined by a survey within certain limits of accuracy.

One commenter states that §§ 171.323(a) and (b) appear to be beyond the scope of the minimum requirements, further stating that the requirements of §§ 171.323(b), (d), and (e) should be a ''market place'' item rather than Federal regulations. These requirements are provided to ensure maintainability and integrity of the MLS which is part of the NAS. These are the minimum requirements. No change is made since the requirements as stated are in the best interest of the owner and the HAS and the rule is adopted as proposed.

Two commenters suggest that in § 171.323(b) of the proposed rule traveling wave tube amplifiers (TWTA) should not be excluded from use. The FAA concurs and a phrase is added to § 171.323(b) that in addition to allowing the use of solid state amplifiers the rule permits the use of TWTA.

One commenter states inconsistencies in referencing Tables 10 and 13 for maintenance alerts in § 171.323(c). The FAA concurs and the references to Tables 10 and 13 are deleted from § 171.323(c). Several commenters further state that the requirements for interfacing with FAA remote monitoring are unclear. The FAA concurs and states in § 171.323(d) that this requirement may be complied with by the addition of optional software and/or hardware in space provided in the original equipment. Furthermore, this interface requirement exists only in the event the sponsor requests the FAA to assume ownership of the MLS.

One commenter requests a reduction of the requirement to operate on the battery backup power in § 171.323(h) and also a clarification of the intent that battery power is not required for the environmental subsystem or de-icing. After further analysis, the FAA concurs. The requirement for battery operations was reduced from 3 hours to 2 hours. This reduction will reduce costs and not significantly impact operation. The text further clarifies that radome de-icers and the environmental systems need not operate from the battery during periods when prime power is not available.

of the MLS datum point is ±3 meters (±10 feet) laterally and ±0.3 meter (±1.0 foot) vertically, while the accuracy for lateral and vertical offsets from the MLS datum point for the other elements referenced to it is ±0.3 meter (±1.0 foot) laterally and ±0.03 meter (±0.1 foot) vertically. Another commenter requests clarification on who is to conduct the survey. The responsibility for conducting the antenna phase center survey is clarified in this section and clearly states that the owner must bear all costs of the survey.

Section 171.325 Maintenance and operations requirements.

The owner of the facility must establish an adequate maintenance system and provide qualified maintenance personnel to maintain the facility at the level attained at the time it was commissioned. The owner must have an approved operations and maintenance manual that sets forth the mandatory procedures for operations and periodic and emergency maintenance.

One commenter questions the requirement in § 171.325(a) for written approval of the qualification of maintenance personnel. This requirement is deleted since the criteria for its application are not finalized. One commenter states that procedures in § 171.325(c)(17) for conducting ground checks of the DME and marker beacon are not described. The requirement to ground check DME and marker beacons is deleted as no formal procedure exists for ground checking these components.

One commenter states that § 171.325(e) on equipment modification is ambiguous in that it is not clear whether or not manufacturers' suggested modifications are mandatory. The FAA concurs. The statement was ambiguous and the paragraph is revised so that all FAA approved modifications must be accomplished.

One commenter states that § 171.325(g) could permit various FAA regions to establish changes and maintenance procedures without public process and concludes that this provision should be deleted. After further analysis, the FAA concurs. FAA regions should not be permitted to establish changes and maintenance procedures, therefore, § 171.325(g) is deleted from the rule. One commenter states that requirements for FAA approved test equipment in § 171.325(i) is outside the scope of the MLS proposal. The FAA concludes that the test equipment used on the NAS facilities must be approved by the FAA to insure system integrity and is within the scope of the proposal. The rule is adopted as proposed.

One commenter suggests that the inservice test evaluation of the system in § 171.325(k) should be made more specific to avoid multiple interpretations in the field. The FAA concurs and adds information to this section sag the frequency if checking the monitor and the length of the burn-in time. Another commenter suggests adding the DME to the list of equipment being checked in § 171.325(k). The FAA concurs and the DME is added.

Section 171.327 Operational records.

The owner of the facility, or his maintenance representative, must submit the following data at the indicated time to the appropriate FAA regional office: (1) Facility Equipment Performance and Adjustment Data (FAA Form 198); (2) Facility Maintenance Log (FAA Form 6030–1); and (3) Technical Performance Records (FAA Form 6830).

One commenter questions whether or not the forms referenced in this section contained reasonable data requirements as the specific forms were not included in the proposed rule for examination. The FAA concludes that these forms are necessary and they are required in all other non-Federal facilities. These forms constitute a record establishing a description and the operational performance requirements for each component of the MLS. The rule is adopted as proposed.

The Amendment

Accordingly, Part 171 of the Federal Aviation Regulations (14 CFR Part 171) is amended, effective December 17, 1981, by adding a new Subpart J.

(Sections 305, 307, 313(a), 601, and 606, Federal Aviation Act of 1958, as amended (49 U.S.C. Sections 1346, 1348, 1354(a), and 1421, and 1426); Section 6(c), Department of Transportation Act (49 U.S.C. Section 1655(c)).

February 26, 1979); and

(3) Will not have a significant economic impact on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

A copy of the evaluation prepared for this regulation has been placed in the regulatory docket and a copy of it may be obtained by contacting the person identified under the caption, "FOR FURTHER INFORMATION CONTACT."

The reporting and recordkeeping requirements contained herein have been approved by the Office of Management and Budget and forms cleared under OMB #2120–0014.

Amendment 171–12

Microwave Landing System Requirements for Non-Federal Navigational Facilities

Adopted: March 14, 1984 **Effective: May 18, 1984**

(Published in 49 FR 15544, April 19, 1984)

SUMMARY: This amendment makes a minor revision to the minimum standards and procedures used for the approval, installation, operation, and maintenance of Microwave Landing System facilities that are not operated and maintained by the FAA. This amendment is necessary to bring those standards in accord with the minimum standards used for the operation and maintenance of FAA facilities.

FOR FURTHER INFORMATION CONTACT: Mr. Sotires P. Mantis, Program Engineering and Maintenance Service (APM–120), Maintenance Engineering Division, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, D.C. 20591, Telephone (202) 426–3628.

SUPPLEMENTARY INFORMATION:

On December 17, 1981, Amendment 171–11 to Part 171 of the Federal Aviation Regulations (FAR's) established the minimum standards and procedures for the approval, installation, operation, and maintenance of a Microwave Landing System (MLS) facility that is not operated and maintained by the FAA. On October 18,1982, the FAA published revisions to Amendment 171–11 (47 FR 46259; October 18, 1982) in which it provided changes to those standards.

The MLS is a system designed to take the place of the Instrument Landing System (ILS) used throughout the world and is projected to meet both civil and military requirements. MLS has been selected for standardization by the International Civil Aviation Organization (ICAO) and chosen to satisfy the need for a new system to future precision approach and landing guidance requirements. Since these facilities may be operated and maintained by persons other than the FAA, the requisite uniform standards and procedures to operate these facilities in the National Airspace System (NAS) must be provided in regulatory form to govern those activities.

With respect to Table 8, in Subpart J of FAR Part 171, the 1982 correction to Amendment 171–11 did not make a change to the range of values for the approach azimuth coverage limits that was needed to bring the format of the Basic Data transmissions into exact conformity with the international standards for MLS. That change is being made by this amendment, and each non-FAA facility will now code the "Approach Azimuth Proportional Coverage Limits" (AAPCL) exactly as prescribed by agreed-upon international standards; consequently, all airborne MLS receivers will decode the AAPCL accurately.

Because this requirement has already been substantially complied with and the changes it imposes are minor in nature, notice and public procedure regarding this action are unnecessary.

already made this simple coding change with no added cost, there is no cost to these equipment manufacturers.

Amendment

According, Part 171 of the Federal Aviation Regulations (14 CFR Part 171) is amended, effective May 18, 1984.

(Secs. 305, 307, 313(a), 601, 606, Federal Aviation Act of 1958, as amended (49 U.S.C. 1343, 1348, 1354(a), 1421, 1426); 49 U.S.C. 106(g) (Revised, Pub. L. 97–449, January 12, 1983).)

NOTE: This amendment merely makes a minor revision to the minimum standards and procedures used for the approval, installation, operation, and maintenance of non-FAA Microwave Landing System facilities. There is only one non-FAA facility and six airborne receivers operating with the old standard and they will only need inexpensive reprogramming; further, manufacturers are aware of this standard and are already in compliance. Consequently, there is only a minor cost impact as a result of this amendment. Accordingly, it has been determined that this final rule is not major under Executive Order 12291 or significant under DOT Regulatory Policies and Procedures (44 FR 11034; February 26, 1979). For these reasons and because there are no cost savings associated with this revision, I certify that, under the criteria of the Regulatory Flexibility Act, this rule will not have a significant economic impact on a substantial number of small entities. In addition, the FAA has determined that the expected impact of this final rule is so minimal that it does not require an evaluation.

Amendment 171–13

Non-Federal Navigation Facilities; Distance Measuring Equipment for Non-Federal Navigational Facilities

Adopted: November 20, 1985 **Effective: November 27, 1985**

(Published in 50 FR 48745, November 27, 1985)

SUMMARY: In 1970, the FAA published a rule that established minimum requirements for the approval and operation of distance measuring equipment (DME) that is not operated and maintained by the FAA. The final rule contained an error in a reference to Annex 10 to the Convention on International Civil Aviation that contains the Specification for UHF Distance Measuring Equipment (DME). This action corrects that reference. This corrective amendment is necessary to properly reference the performance requirements of DME.

FOR FURTHER INFORMATION CONTACT: Mr. Sotires P. Mantis, Federal Aviation Administration, Maintenance Engineering Division, Program Engineering and Maintenance Service, APM–120, Washington, D.C. 20591; Telephone: (202) 426–3628.

SUPPLEMENTARY INFORMATION: On August 11, 1970, the FAA published Amendment 171–7 to Part 171 of the Federal Aviation Regulations (14 CFR Part 171), (35 FR 12709). The rule, at § 171.157(a), contained an incorrect reference to a section of Annex 10 to the Convention on International Civil Aviation. This amendment corrects that reference and informs non-Federal sponsors that Annex 10 to the Convention on International Civil Aviation now also includes the specification for a precision DME. Because this action is necessary to correct an improper legal reference in a regulation and to prescribe the originally intended regulatory requirements of FAR § 171.157(a), and since this action is only corrective in nature, I find that notice and public procedure regarding this action are impractical and unnecessary. Further,

For the reasons set forth above, Part 171 of the Federal Aviation Regulations (14 CFR Part 171) is amended effective November 27, 1985.

Authority: 49 U.S.C. 1343, 1348, 1354(a), 1421, and 1426; 49 U.S.C. 106(g) (Revised Public Law 97–449, January 12, 1983).

Amendment 171–14

Microwave Landing System Requirements for Non-Federal Navigational Facilities

Adopted: September 15, 1986 **Effective: September 18, 1986**

(Published in 51 FR 33176, September 18, 1986)

SUMMARY: This rule updates the standards and procedures for the selection and maintenance of a Microwave Landing System (MLS) owned and operated by a private or a non-Federal entity. Since the approval of the original non-Federal MLS regulation, refinements and international standardization have occurred which now make the MLS more widely usable and acceptable to all users worldwide. This final rule incorporates these internationally accepted standards and provides the conformity necessary so that the MLS will be available to all users.

FOR FURTHER INFORMATION CONTACT: Mr. Sotires P. Mantis, Program Engineering and Maintenance Service, Maintenance Engineering Division, APM–120, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, D.C. 20591; Telephone: (202) 267–8299.

SUPPLEMENTARY INFORMATION: On December 17, 1981, the FAA issued a new Subpart J, Microwave Landing System, in Part 171 of the Federal Aviation Regulations, 14 CFR Part 171 (46 FR 61560). The new subpart established minimum standards and procedures for the approval, installation, operation, and maintenance of an MLS facility that is not operated and maintained by the FAA. The FAA revised Subpart J in 1982 (47 FR 46259, October 18, 1982) and in 1984 (49 FR 15544, April 19, 1984) to provide changes to those standards.

The MLS is a system designed to take the place of the Instrument Landing System used throughout the world and is projected to meet both civil and military requirements. The MLS has been selected for standardization by the International Civil Aviation Organization (ICAO) and chosen to satisfy the need for a new system to landing precision approach and landing guidance requirements. Since these facilities may be operated and maintained by persons other than the FAA, the requisite uniform standards and procedures to operate these facilities in the National Airspace System (NAS) must be provided in regulatory form to govern those activities. The amendment is needed to bring the non-Federal MLS standards into conformity with the Federal and international standards for the MLS.

Currently, there are three sets of standards governing MLS equipment in use in the United States. There is an international standard which all equipment must meet (ICAO International Standards, Recommended Practices and Procedures for Air Navigation Services, Annex 10). There is a federal standard which all FAA equipment must meet (FAA–STD–022b, MLS Interoperability and Performance Requirements). Finally, there is a standard for non-Federal MLS equipment (FAR Part 171) which governs those facilities not operated and maintained by the FAA. Uniform standards must be provided so that there is complete interoperability among all MLS ground and airborne equipment in use throughout the world.

In September of 1984, the tenth meeting of the ICAO All Weather Operations Panel published a report (AWOP/10, September 4–20, 1984, ICAO Document 9449) which included a recommendation to make some changes in the current ICAO standards for MLS. The majority of the recommended

will conform to one set of standards. A more stringent requirement has not been imposed in any area of the standards which affects equipment interoperability. In those areas, all three standards will be identical.

Cost of Compliance

The cost of compliance with this amendment will be minimal. Non-Federal MLS ground equipment already deployed will require some reprogramming of a device; usually a Programmable Read Only Memory (PROM) in which software coding is stored. There are only five non-Federal MLS ground facilities operating in the United States. There is also a limited number of airborne equipment in use which will be affected by this change. A large number of these are Government owned. The modification to the airborne equipment is similar to that previously described for the ground equipment. In addition, all manufacturers of MLS equipment have been aware of these pending changes since publication of the ICAO AWOP/10 report in September 1984 and, therefore, are prepared to make the appropriate change in their equipment. The FAA has determined that this amendment is necessary in order to comply with international standards.

The FAA has determined that this regulation only involves an established body of technical regulations for which frequent and routine amendments are necessary to keep them operationally current. It, therefore, (1) is not a "major rule" under Executive Order 12291; (2) is not a "significant rule" under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979); and (3) does not warrant a regulatory evaluation as the anticipated impact is so minimal.

As was stated previously, only a very few facilities are affected to a minor degree. Therefore, I certify that this rule will not have a significant economic impact on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

Organizations representing all segments of the aviation industry affected by this amendment, all manufacturers of MLS equipment in the U.S., and the five current operators of non-Federal MLS facilities have participated in or have been made fully aware of the development of the standards adopted. In consideration of the above, I find that notice and public procedures under 5 U.S.C. 553 are unnecessary, because all affected parties have had prior notice of the standards adopted, and are impractible, because any delay in implementation of the standards would permit the existence of incompatible MLS ground stations and airborne receivers. For the same reason, I find that good cause exists for making this rule effective upon publication.

Adoption of the Amendment

For the reasons set forth above, Part 171 of the Federal Aviation Regulations (14 CFR Part 171) is amended effective September 18, 1986.

Authority: 49 U.S.C. 1343, 1346, 1348, 1354(a), 1355, 1401, 1421–1430, 1472(c), 1502, and 1522; 49 U.S.C. 105(g) (Revised Public Law 97–449, January 12, 1983).

Amendment 171–15

Organizational Changes and Delegations of Authority

Adopted: September 15, 1989 **Effective: October 25, 1989**

(Published in 54 FR 39288, September 25, 1989)

SUMMARY: This amendment adopts changes to office titles and certain terminology in the regulations that were affected by a recent agencywide reorganization. These changes are being made to reflect delegations of authority that were changed, as well as offices that were renamed or abolished and replaced

On July 1, 1988, the FAA underwent a far-reaching reorganization that affected both headquarters and regional offices. The most significant change is that certain Regional Divisions and Offices, which formerly reported to the Regional Director, are now under "straight line" authority, meaning that these units within each Regional Office report to the appropriate Associate Administrator (or Chief Counsel) in charge of the function performed by that unit.

Within Part 11 of the Federal Aviation Regulations (FAR), various elements of the FAA have been delegated rulemaking authority by the Administrator. These delegations need to be updated. In addition, throughout the Federal Aviation Regulations references are made to offices that have been renamed or are no longer in existence as a result of reorganization.

Title 14 of the Code of Federal Regulations must therefore be amended to reflect the reorganizations and changes that have taken place.

Paperwork Reduction Act

The paperwork requirements in sections being amended by this document have already been approved. There will be no increase or decrease in paperwork requirements as a result of these amendments, since the changes are completely editorial in nature.

Good Cause Justification for Immediate Adoption

This amendment is needed to avoid possible confusion about the FAA reorganization and to hasten the effective implementation of the reorganization. In view of the need to expedite these changes, and because the amendment is editorial in nature and would impose no additional burden on the public, I find that notice and opportunity for public comment before adopting this amendment is unnecessary.

Federalism Implications

The regulations adopted herein will not have substantial direct effects on the states, on the relationship between the National government and the states, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this final rule does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

The FAA has determined that this document involves an amendment that imposes no additional burden on any person. Accordingly, it has been determined that: The action does not involve a major rule under Executive Order 12291; it is not significant under DOT Regulatory Policies and Procedures (44 FR 11034; February 26, 1979); and because it is of editorial nature, no impact is expected to result and a full regulatory evaluation is not required. In addition, the FAA certifies that this amendment will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

The Rule

In consideration of the foregoing, the Federal Aviation Administration amends the Federal Aviation Regulations (14 CFR Chapter I) effective October 25, 1989.

The authority citation for Part 171 continues to read as follows:

Authority: 49 U.S.C. 1343, 1346, 1348, 1354(a), 1355, 1401, 1421–1430, 1472(c), 1502, and 1522; 49 U.S.C. 106(g) (Revised Pub. L. 97–449, January 12, 1983).

in regard to airspace classifications. These changes are intended to: (1) simplify airspace designations; (2) achieve international commonality of airspace designations; (3) increase standardization of equipment requirements for operations in various classifications of airspace; (4) describe appropriate pilot certificate requirements, visual flight rules (VFR) visibility and distance from cloud rules, and air traffic services offered in each class of airspace; and (5) satisfy the responsibilities of the United States as a member of the International Civil Aviation Organization (ICAO). The final rule also amends the requirement for minimum distance from clouds in certain airspace areas and the requirements for communications with air traffic control (ATC) in certain airspace areas; eliminates airport radar service areas (ARSAs), control zones, and terminal control areas (TCAs) as airspace classifications; and eliminates the term "airport traffic area." The FAA believes simplified airspace classifications will reduce existing airspace complexity and thereby enhance safety.

EFFECTIVE DATES: These regulations become effective September 16, 1993, except that §§ 11.61(c), 91.215(b) introductory text, 91.215(d), 71.601, 71.603, 71.605, 71.607, and 71.609 and Part 75 become effective December 12, 1991, and except that amendatory instruction number 20, § 71.1, is effective as of December 17, 1991 through September 15, 1993, and that §§ 71.11 and 71.19 become effective October 15, 1992. The incorporation by reference of FAA Order 7400.7 in § 71.1 (amendatory instruction number 20) is approved by the Director of the Federal Register as of December 17, 1991 through September 15, 1993. The incorporation by reference of FAA Order 7400.9 in § 71.1 (amendatory instruction number 24) is approved by the Director of the Federal Register as of September 16, 1993 through September 15, 1994.

FOR FURTHER INFORMATION CONTACT: Mr. William M. Mosley, Air Traffic Rules Branch, ATP–230, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, D.C. 20591, telephone (202) 267-9251.

SUPPLEMENTARY INFORMATION:

Background

On April 22, 1982, the NAR plan was published in the *Federal Register* (47 FR 17448). The plan encompassed a review of airspace use and the procedural aspects of the ATC system. Organizations participating with the FAA in the NAR included: Aircraft Owners and Pilots Association (AOPA), Air Line Pilots Association (ALPA), Air Transport Association (ATA), Department of Defense (DOD), Experimental Aircraft Association (EAA), Helicopter Association International (HAI), National Association of State Aviation Officials (NASAO), National Business Aircraft Association (NBAA), and Regional Airline Association (RAA).

The main objectives of the NAR were to:

(1) Develop and incorporate a more efficient relationship between traffic flows, airspace allocation, and system capacity in the ATC system. This relationship will involve the use of improved air traffic flow management to maximize system capacity and to improve airspace management.

(2) Review and eliminate, wherever practicable, governmental restraints to system efficiency thereby reducing complexity and simplifying the ATC system.

(3) Revalidate ATC services within the National Airspace System (NAS) with respect to state-of-the-art and future technological improvements.

In furtherance of the foregoing objectives, several NAR task groups were organized and assigned to review various issues associated with airspace classifications and ATC procedures, pilot certification requirements, and aircraft equipment and operating requirements in the different categories of airspace

all aircraft.

Class B Airspace (U.S. Terminal Control Areas). Operations may be conducted under IFR, special visual flight rules (SVFR), or VFR. However, all aircraft are subject to ATC clearances and instructions. ATC separation is provided to all aircraft.

Class C Airspace (U.S. Airport Radar Service Areas). Operations may be conducted under IFR, SVFR, or VFR; however, all aircraft are subject to ATC clearances and instructions. ATC separation is provided to all aircraft operating under IFR or SVFR and, as necessary, to any aircraft operating under VFR when any aircraft operating under IFR is involved. All VFR operations will be provided with safety alerts and, upon request, conflict resolution instructions.

Class D Airspace (U.S. Control Zones for Airports with Operating Control Towers and Airport Traffic Areas that are not associated with a TCA or an ARSA). Operations may be conducted under IFR, SVFR, or VFR; however, all aircraft are subject to ATC clearances and instructions. ATC separation is provided to aircraft operating under IFR or SVFR only. All traffic will receive safety alerts and, on pilot request, conflict resolution instructions.

Class E Airspace (U.S. General Controlled Airspace). Operations may be conducted under IFR, SVFR, or VFR. ATC separation is provided only to aircraft operating under IFR and SVFR within a surface area. As far as practical, ATC may provide safety alerts to aircraft operating under VFR.

Class F Airspace (U.S. Has No Equivalent). Operations may be conducted under IFR or VFR. ATC separation will be provided, so far as practical, to aircraft operating under IFR.

Class G Airspace (U.S. Uncontrolled Airspace). Operations may be conducted under IFR or VFR. ATC separation is not provided.

Discussion of the Amendments and Public Comments

This final rule is based on Notice of Proposed Rulemaking (NPRM) No. 89–28 (54 FR 42916; October 18, 1989). The rule amends Parts 1, 11, 45, 61, 65, 71, 75, 91, 93, 101, 103, 105, 121, 127, 135, 137, 139, and 171 and Special Federal Aviation Regulations (SFAR) 51-1, 60, and 62. These parts either incorporate airspace designations and operating rules or amend the existing rule to meet the new classification language.

Amendments to Part 1 delete the definition of an ''airport traffic area'' and add definitions of ''Special VFR conditions'' and ''Special VFR operations.''

The amendments to Part 71 establish a new Subpart M—Jet Routes and Area High Routes that includes the existing rules in Part 75 as of *December 17, 1991*; revise §§ 71.11 and 71.19 as of October 15, 1992; and revise all of Part 71 to reclassify U.S. airspace in accordance with the ICAO designations as of September 16, 1993. (Further information on the amendments to Part 71 appears in this discussion under *Revisions to Part 71.*) Under this amendment the positive control areas (PCAs), jet routes, and area high routes are reclassified as Class A airspace areas; TCAs are reclassified as Class B airspace areas; ARSAs are reclassified as Class C airspace areas; control zones for airports with operating control towers and airport traffic areas that are not associated with the primary airport of a TCA or an ARSA are reclassified as Class D airspace areas; all Federal airways, the Continental Control Area, control areas associated with jet routes outside the Continental Control Area, additional control areas, control area extensions, control zones for airports without operating control towers, transition areas, and area low routes are reclassified as Class E airspace areas; and airspace which is not otherwise designated as the Continental Control Area, a control area, a control zone, a terminal control area, an airport radar service area, a transition area, or special use airspace is reclassified as Class G airspace. Because airport traffic areas are not classified as airspace areas, this amendment establishes controlled airspace for airports with operating control towers, but without control zones.

jurisdiction over the airspace concerned is permitted to authorize deviations from the transponder requirements in § 91.215(b) and that a request for a deviation due to an inoperative transponder or an operating transponder without operating automatic pressure altitude reporting equipment having Mode C capability may be made at any time. To provide maximum flexibility to ATC and aircraft operators, this amendment has an effective date of December 12, 1991.

Amendments to Parts 11, 45, 61, 65, 93, 101, 103, 105, 121, 127, 135, 137, 139, and 171 change the terminology to integrate the adopted airspace classifications into respective regulations that refer to those airspace assignments and operating rules. In addition, § 11.61(c) is amended to meet an administrative change within the FAA for titles of persons under the term "Director."

The final rule includes modifications to the proposed rules based on amendments to the FAR that have become effective since the publication of NPRM No. 89–28. The section numbers to Part 91 are changed to match the section numbers designated by Amendment No. 91–211, Revision of General Operating and Flight Rules (54 FR 34292; August 19, 1989). Sections 91.129 and 91.130 are modified to include revisions to § 91.130 by Amendment No. 91–215, Airport Radar Service Area (ARSA) Communication Requirement (55 FR 17736; April 26, 1990). Section 91.131(c) is modified to include revisions from Amendment No. 91–216, Navigational Equipment Requirement in a Terminal Control Area (TCA) and Visual Flight Rules (VFR) Operations (55 FR 24822; June 18, 1990). Section 91.117(a) is modified to include revision by Amendment No. 91–219, Revision to General Operating and Flight Rules (55 FR 34707; August 24, 1990).

Section 91.155(b)(1) is modified to include a revision by Amendment No. 91–224, Inapplicability of Basic VFR Weather Minimums for Helicopter Operations (56 FR 48088; September 23, 1991). Section 91.155(c) was revised by Amendment No. 91-213, Night-Visual Flight Rules Visibility and Distance from Cloud Minimums (55 FR 10610; March 22, 1990) and was corrected on July 19, 1990 (55 FR 29552) and November 13, 1990 (55 FR 47309).

In this amendment, the FAA does not adopt the proposal to lower the Continental Control Area to 1,200 feet above the surface and to establish the United States Control Area as proposed in NPRM No. 88–2. The FAA will not adopt this proposal and the regulatory agenda will be revised to delete the U.S. Control Area project.

On October 4, 1990, the FAA established SFAR No. 60—Air Traffic Control System Emergency Operations (55 FR 40758) and on December 5, 1990, the FAA established SFAR No. 62—Suspension of Certain Aircraft Operations from the Transponder with Automatic Pressure Altitude Reporting Capability Requirement (55 FR 50302). These SFARs are revised by replacing references to such terms as "terminal control area" with "Class B airspace area" to integrate the appropriate airspace classification.

Obsolete clauses in the existing rule are deleted and typographical errors in the proposal are corrected. The final rule also revises affected paragraphs of the existing rule requiring modification as a result of the rulemaking action but not included in NPRM No. 89–28. The modifications to these paragraphs replace such terms as "terminal control area" and "control zone" with language to integrate the appropriate airspace classification.

Under airspace reclassification, the Sabre U.S. Army Heliport (Tennessee) Airport Traffic Area will become a Class D airspace area; the Jacksonville, Florida, Navy Airport Traffic Area will become three separate but adjoining Class D airspace areas; and the El Toro, California, Special Air Traffic Rules will become part of the El Toro Class C airspace area. Currently, these airports operate under special air traffic rules in Subparts N, O, and R of Part 93. To achieve a goal of airspace reclassification, which is to simplify airspace, the existing rules for these airspace areas are to be deleted as of September 16, 1993. Therefore, this amendment removes and reserves Subparts N, O, and R of Part 93 as of September 16, 1993.

Subpart M follows:

Part 75—Establishment of Jet Routes & Area High Routes		Part 71, Subpart M—Jet Routes & Area High Routes	
§ 75.1	Applicability.	§ 71.601	Applicability.
§ 75.11	Jet routes.	§ 71.603	Jet routes.
§ 75.13	Area routes above 18,000 feet MSL.	§ 71.605	Area routes above 18,000 feet MSL.
§ 75.100	Jet routes.	§ 71.607	Jet route descriptions.
§ 75.400	Area high routes.	§ 71.609	Area high route descriptions.

Sections 71.607, Jet route descriptions, and 71.609, Area high route descriptions are not set forth in the full text of this final rule. The complete listing for all jet routes and area high routes can be found in FAA Order 7400.7, *Compilation of Regulations*, which was last published as of April 30, 1991, and effective November 1, 1991. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of this order may be obtained from the Document Inspection Facility, APA–220, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, D.C. 20591, (202) 267-3484. Copies may be inspected in Docket Number 24456 at the Federal Aviation Administration, Office of the Chief Counsel, AGC–10, Room 915G, 800 Independence Avenue, SW., Washington, D.C. 20591 weekdays between 8:30 a.m. and 5 p.m. or at the Office of the Federal Register, 1100 L Street, N.W., Room 8401, Washington, D.C. The Part 75 sections referenced in FAA Order 7400.7 will be redesignated as Part 71 sections in the next revision to FAA Order 7400.7.

The second revision amends existing § 71.11, Control zone, and § 71.19, Bearings; radials; miles, and is effective October 15, 1992. This revision relates to the FAA's parallel reviews of certain airspace areas. The revision to § 71.11 permits the Administrator to terminate the vertical limit of a control zone at a specified altitude. The revision to § 71.19 provides for the conversion from statute miles to nautical miles and consists of the same language as § 71.7 that is effective September 16, 1993. More detail on the review of certain airspace areas is found under the title *Implementation of Airspace Reclassification.*

The third revision to Part 71 establishes a new Part 71 that includes the adopted airspace designations. This amendment, which is effective September 16, 1993, transfers the current sections of existing Part 71, including Subpart M—Jet Routes and Area High Routes, to this new Part 71. The following table lists the sections of existing Part 71, including Subpart M and the corresponding sections in the new Part 71, that are effective September 16, 1993. Subparts B through K and §§ 71.501(b), 71.607, and 71.609, which list airspace descriptions, are not set forth in the full text of this final rule. The complete listing for these airspace designations can be found in FAA Order 7400.9, *Airspace Reclassification,* which is effective September 16, 1993. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. Copies of this order may be obtained from the Document Inspection Facility, APA-220, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, D.C. 20591, (202) 267-3484. Copies may be inspected in Docket Number 24456 at the Federal Aviation Administration, Office of the Chief Counsel, AGC–10, Room 915G, 800 Independence Avenue, SW., Washington, D.C. 20591 weekdays between 8:30 a.m. and 5 p.m. or at the Office of the Federal Register, 1100 L Street, N.W., Room 8401, Washington, D.C.

§ 71.6	Extent of area low routes.	§ 71.77 Extent of area low routes.
§ 71.7	Control areas.	Not applicable.
§ 71.9	Continental control area.	§ 71.71 Class E airspace.
§ 71.11	Control zones.	Not applicable.
§ 71.12	Terminal control areas.	§ 71.41 Class B airspace.
§ 71.13	Transition areas.	§ 71.71 Class E airspace.
§ 71.14	Airport radar service areas.	§ 71.51 Class C airspace.
§ 71.15	Positive control areas.	§ 71.31 Class A airspace.
§ 71.17	Reporting points.	§ 71.5 Reporting Points.
§ 71.19	Bearings; Radials; Miles.	§ 71.7 Bearings, radials, mileages.
	Subpart B—Colored Federal Airways	***Subpart E—Class E Airspace***
§ 71.101	Designation.	Subpart E of FAA Order 7400.9.
§ 71.103	Green Federal airways.	Subpart E of FAA Order 7400.9.
§ 71.105	Amber Federal airways.	Subpart E of FAA Order 7400.9.
§ 71.107	Red Federal airways.	Subpart E of FAA Order 7400.9.
§ 71.109	Blue Federal airways.	Subpart E of FAA Order 7400.9.
	Subpart C—VOR Federal Airways	***Subpart E—Class E Airspace***
§ 71.121	Designation.	§ 71.79 Designation of VOR Federal airways.
§ 71.123	Domestic VOR Federal airways.	Subpart E of FAA Order 7400.9.
§ 71.125	Alaskan VOR Federal airways.	Subpart E of FAA Order 7400.9.
§ 71.127	Hawaiian VOR Federal airways.	Subpart E of FAA Order 7400.9.
	Subpart D—Continental Control Area	***Subpart E—Class E Airspace***
§ 71.151	Restricted areas included.	Subpart E of FAA Order 7400.9.
	Subpart E—Control Areas and Control Area Extensions	***Subpart E—Class E Airspace***
§ 71.161	Designation of control areas associated with jet routes outside the continental control area.	§ 71.71 Class E airspace and Subpart E of FAA Order 7400.9.
§ 71.163	Designation of additional control areas.	§ 71.71 Class E airspace and Subpart E of FAA Order 7400.9.
§ 71.165	Designation of control areas extensions.	Subpart E of FAA Order 7400.9.

§ 71.181	Designation.	Subpart E of FAA Order 7400.9.
	Subpart H—Positive Control Areas	*Subpart A—General; Class A Airspace*
§ 71.193	Designation.	§ 71.33 Class A airspace areas.
	Subpart I—Reporting Points	*Subpart H—Reporting Points*
§ 71.201	Designation.	§ 71.901 Applicability.
§ 71.203	Domestic low altitude reporting points.	Subpart H of FAA Order 7400.9.
§ 71.207	Domestic high altitude reporting points.	Subpart H of FAA Order 7400.9.
§ 71.209	Other domestic reporting points.	Subpart H of FAA Order 7400.9.
§ 71.211	Alaskan low altitude reporting points.	Subpart H of FAA Order 7400.9.
§ 71.213	Alaskan high altitude reporting points.	Subpart H of FAA Order 7400.9.
§ 71.215	Hawaiian reporting points.	Subpart H of FAA Order 7400.9.
	Subpart J—Area Low Routes	*Subpart E—Class E Airspace*
§ 71.301	Designation.	Subpart E of FAA Order 7400.9.
	Subpart K—Terminal Control Areas	*Subpart B—Class B Airspace*
§ 71.401(a)	Designation.	Subpart B of FAA Order 7400.9.
§ 71.401(b)	Terminal control areas.	Subpart B of FAA Order 7400.9.
	Subpart L—Airport Radar Service Areas	*Subpart C—Class C Airspace*
§ 71.501	Designation.	Subpart C of FAA Order 7400.9.
	Subpart M—Jet Routes and Area High Routes	*Subpart A—General; Class A Airspace*
§ 71.601	Applicability.	Not applicable.
§ 71.603	Jet routes.	Subpart A of FAA Order 7400.9.
§ 71.605	Area routes above 18,000 feet MSL.	Subpart A of FAA Order 7400.9.
§ 71.607	Jet route descriptions.	Subpart A of FAA Order 7400.9.
§ 71.609	Area high route descriptions.	Subpart A of FAA Order 7400.9.

Discussion of Comments

A total of 205 commenters submitted comments to Docket No. 24456 on NPRM No. 89–28. The FAA considered these comments in the adoption of this rule and changes to the proposals were made accordingly. Some comments did not specifically apply to any particular proposal addressed in NPRM

effort and each classification of airspace. A general division entitled, *Additional Comments*, addresses issues that do not affect a specific airspace classification. Each discussion includes a description of the final amendment and an explanation of the FAA's views.

Reclassification of Airspace

One hundred and forty-one comments on the proposal to reclassify U.S. airspace to meet ICAO standards were submitted. Sixty-eight supported reclassification and 69 opposed reclassification. Four commenters neither supported nor opposed the reclassification effort, but offered observations.

The 68 supporting comments include those submitted by the ATA, ATCA, and COPA. The COPA stated that on an average, approximately 60,000 general aviation aircraft cross the U.S./Canadian border each year. Some commenters stated that the proposed classifications are easier to understand than the current classifications and noted that the proposed classifications would help develop standardization. Two flight instructors commented that the proposed classifications would aid in the teaching of the airspace system to new pilots.

The 69 opposing comments include the Arizona Pilots Association, EAA, and SSA. Several comments, including EAA's, asserted that the current airspace designation names are more descriptive, and hence, easier to remember. Several comments, including one from the Arizona Pilots Association, stated that the proposal would cause confusion, while other commenters alleged that the proposal would only benefit pilots who operate internationally.

Both the SSA and the Arizona Pilots Association recommend that existing airspace nomenclature be retained and a table be included in the *Airman's Information Manual* (AIM) or Part 91 to correlate U.S. airspace designations and ICAO equivalents.

The four comments submitted that do not directly support or oppose the proposal include those from the Alaska Airmen's Association, ALPA, and AOPA. The AOPA expressed concerns about how pilots would be reeducated during the transition phase that would precede the adoption of the proposed airspace reclassification. AOPA recommended that the FAA take five steps to ensure proper pilot education: (1) convene a government, industry, and user meeting before the issuance of a final rule to consider the implications of final rule adoption; (2) ensure that all necessary funding is in place, including monies for the specific purpose of pilot education; (3) adopt a dual airspace system during the transition phase; (4) coordinate with the National Oceanic and Atmospheric Administration (NOAA) to ensure that all charts are printed in a timely manner; and (5) amend the flight review requirements to reflect explicitly the need to discuss airspace classifications. The FAA agrees that the aviation public needs to be educated in airspace reclassification. Therefore, the FAA has developed an education and transition program, which is discussed under ''Education of the Aviation Community.''

As proposed, the FAA will reclassify U.S. airspace in accordance with ICAO standards. Airspace areas, with the exception of special use airspace (SUA) designations, will be classified by a single alphabet character. The FAA believes that reclassification of U.S. airspace simplifies the airspace system, achieves international commonality, enhances aviation safety, and satisfies the responsibility of the United States as a member of ICAO.

Some commenters misunderstood the proposal on airspace reclassification. These commenters understood Class A airspace areas to be en route airspace and Class B, Class C, and Class D airspace areas to be terminal airspace. The recommended ICAO airspace classes are not based on whether the airspace area is designated for ''en route'' or ''terminal'' operations, but rather on other factors that include type of operation (i.e., IFR, VFR) and ATC services provided. (The table below lists the new airspace classifications, its equivalent in the existing airspace classification, and its features, which would apply to terminal and en route airspace areas.) For example, under this rule Class C airspace is designated in terminal areas. Class C airspace in another country could be designated in en route areas. However, the type of operation, ATC services provided, minimum pilot qualifications, two-way radio requirements, and VFR minimum visibility and distance from cloud requirements in that country's Class C airspace

AIRSPACE FEATURES	CLASS A AIRSPACE	CLASS B AIRSPACE	CLASS C AIRSPACE	CLASS D AIRSPACE	CLASS E AIRSPACE	CLASS G AIRSPACE
Current Airspace Equivalent	Positive Control Areas	Terminal Control Areas	Airport Radar Service Areas	Airport Traffic Areas and Control Zones	General Controlled Airspace	Uncontrolled Airspace
Operations Permitted	IFR	IFR and VRF	IFR and VFR	IFR and VFR	IFR and VFR	IFR and VFR
Entry Prerequisites	ATC clearance	ATC clearance	ATC clearance for IFR Radio contact for all	ATC clearance for IFR Radio contact for all	ATC clearance for IFR Radio contact for all IFR	None
Minimum Pilot Qualifications	Instrument rating	Private or student certificate	Student certificate	Student certificate	Student certificate	Student certificate
Two-way radio communications	Yes	Yes	Yes	Yes	Yes for IFR operations	No
VFR Minimum Visibility	Not applicable	3 statute miles	3 statute miles	3 statute miles	*3 statute miles	**1 statute mile
VFR Minimum Distance from Clouds	Not applicable	Clear of clouds	500 feet below, 1,000 feet above, and 2,000 feet horizontal	500 feet below, 1,000 feet above, and 2,000 feet horizontal	*500 feet below, 1,000 feet above, and 2,000 feet horizontal	**500 feet below, 1,000 feet above, and 2,000 feet horizontal
Aircraft Separation	All	All	IFR, SVFR, and runway operations	IFR, SVFR and runway operations	IFR, SVFR	None
Conflict Resolution	Not applicable	Not applicable	Between IFR and VFR operations	No	No	No
Traffic Advisories	Not applicable	Not applicable	Yes	Workload permitting	Workload permitting	Workload permitting
Safety Advisories	Yes	Yes	Yes	Yes	Yes	Yes

*Different visibility minimum and distance from cloud requirements exist for operations above 10,000 feet MSL.

**Different visibility minima and distance from cloud requirements exist for night operations, operations above 10,000 feet MSL, and operations below 1,200 feet AGL.

Offshore Airspace

The FAA adopts, as proposed, the NAR recommendations NAR 3–2.1.1—Offshore Airspace Nomenclature, NAR 3–2.1.2—Offshore Control Area Uniform Base, NAR 3–2.1.3—Offshore Control Area Identification, and NAR 3–2.1.4—Offshore Airspace Classification, which consider offshore airspace areas. However, NAR 3–2.1.2, which recommends a uniform base for offshore control areas of 1,200 feet above the surface unless otherwise designated, and NAR 3-2.1.3, which recommends that offshore control areas be identified with a name as opposed to a number are contingent on the FAA's further review. (More details on the review process appear later in this document under the title *Implementation of Airspace Reclassification.*) Any changes to offshore airspace areas resulting from the FAA's review will be accomplished by separate rulemaking actions. The FAA's review is being conducted in compliance with Executive

The FAA has begun to coordinate with a task group of the Interagency Air Cartographic Committee (IACC) and the National Ocean Service (NOS), which will begin to update aeronautical charts. During the transition, the FAA will update its orders, manuals, handbooks, and advisory circulars, and will provide pilot/controller education. Significant dates in the transition process appear below with additional discussion following.

AIRSPACE RECLASSIFICATION TRANSITION

Tentative Date	*Event*
October 15, 1992	First sectional aeronautical charts (SAC), world aeronautical charts (WAC), and terminal aeronautical charts (TAC) are published with legends that indicate both existing and future airspace classifications.
March 4, 1993	Initial charting changes are completed for the SAC and TAC.
June 24, 1993	North Pacific, Gulf of Mexico, and Caribbean planning charts are published with legends that indicate both existing and future airspace classifications.
August 19, 1993	Flight Case Planning and North Atlantic Route charts are published with legends that indicate existing and future airspace classifications.
September 16, 1993	New airspace classifications become effective. All charts begin publication with legends that indicate both the new airspace classification and the former airspace classification. All related publications are updated.
March 3, 1994	First charts are published with legends that only indicate the new airspace classifications.
August 17, 1994	All charts are published with legends that only indicate the new airspace classifications.

Coordination with a task group of the IACC and the NOS will continue throughout the transition. An anticipated modification to the symbols on aeronautical charts is the addition of a segmented magenta line to represent the controlled airspace area for airports without operating control towers that extends upward from the surface (Class E airspace). A segmented blue line (which currently depicts a control zone) will denote a Class D airspace area, the controlled airspace for airports with operating control towers that are not the primary airport of a TCA or an ARSA.

The legends in aeronautical charts will include both the existing airspace classifications and the airspace classifications to be effective September 16, 1993. For example, the solid blue line that symbolizes a TCA will be followed by "TCA (Class B)." The first charts with a dual legend will be published October 15, 1992. Commencing September 16, 1993, the legends on these charts will be reversed [e.g., a solid blue line will be followed by "Class B (TCA)"]. Between March 3 and August 17, 1994, the use of dual indication legends will be phased out.

Between October 1992 and March 1993, educational materials such as pocket guides, a video, and posters will be issued to instruct the aviation public on airspace reclassification. The FAA will begin to update the AIM and other publications, as well as FAA orders, manuals, handbooks, and advisory circulars that must be revised to include the new airspace classifications and an explanation of the transition and implementation procedures.

The transition and implementation of the Airspace Reclassification final rule also will include parallel reviews of certain current airspace designations to meet the new airspace classifications. A full discussion on this review appears later in this document under the title *Implementation of Airspace Reclassification.*

meet the criteria of Class A airspace as adopted by ICAO.

As noted earlier, the recommended ICAO airspace classes are not based on whether the airspace area is designated for "en route" or "terminal" operations. Any new Class A airspace areas would be proposed in separate rulemaking actions.

Class B Airspace

NPRM No. 89–28 proposed to reclassify TCAs as Class B airspace areas and to amend the minimum distances by which aircraft operating under VFR must remain from clouds. The current VFR minimum distance requirements of 500 feet below, 1,000 feet above, and 2,000 feet horizontal from clouds will be amended to require that the pilot must remain clear of clouds.

One comment supports and two comments specifically oppose the proposed reclassification. Twelve comments on the proposal to amend minimum distance from clouds for VFR operations in Class B airspace areas were received. Eight of these comments support and four oppose the proposal.

The comments submitted in support of the proposal to reclassify TCAs as Class B airspace areas and to modify the minimum distances from cloud for VFR operations include those from AOPA, the Alaska Airmen's Association, EAA, and SSA. AOPA stated that the proposal "is a positive step in improvement of VFR traffic flow within" Class B airspace areas.

A commenter in support of reclassification stated that some of the areas to be classified as Class B airspace areas could be redesignated as Class C airspace areas.

The four comments submitted in opposition to the proposed amendment on distance from cloud requirements for VFR operations include a comment from ALPA. Some commenters stated that the proposal to modify the minimum distance from clouds for VFR flight in Class B airspace areas reduces the existing margin of safety. ALPA further stated that the ability of a pilot to maintain visual contact with other aircraft is reduced if aircraft operate in close proximity to clouds. One commenter stated that the proposals do not answer the need for clear radio failure procedures in Class B airspace areas. Another commenter stated that Class B airspace areas are actually divided into two types of Class B airspace: one in which a private pilot certificate is required and one in which, at a minimum, only a student pilot certificate is required.

This rulemaking reclassifies existing airspace areas with the equivalent recommended ICAO airspace area. It does not redesignate existing airspace areas. For example, the redesignation of a Class B airspace area (TCA) to a Class C airspace area (ARSA) is beyond the scope of this rulemaking. The FAA believes that the elimination of terminal areas designated as Class B airspace areas would create a substantial adverse impact on the safe and efficient control of air traffic in those high volume terminal areas. Class B airspace areas, like the TCAs that preceded them, provide more efficient control in terminal areas where there is a large volume of air traffic and where a high percentage of that traffic is large turbine-powered aircraft. Additionally, on July 25, 1991, the FAA revised FAA Order 7110.65, *Air Traffic Control*, by adopting specific separation standards for operations under VFR in existing TCAs. These standards require air traffic controllers to separate aircraft operating under VFR in existing TCAs from other aircraft operating under VFR and IFR.

As stated in NPRM No. 89–28 in response to NAR 1–7.2.9—Recommended VFR Minima, the FAA views the relaxation of the distance from cloud requirements for VFR operations as a modification that would enhance rather than reduce safety. Under the existing regulations, a pilot operating an aircraft under VFR in a TCA (Class B airspace) is provided with ATC services and is subject to ATC clearances and instructions. For the pilot operating under VFR to remain specific distances from clouds, the pilot must alter course or assigned heading/route, which is a disruption to traffic flow and could be a compromise to safety. The amendment will increase safety for pilots operating under VFR and ATC by permitting these pilots to remain clear of clouds in Class B airspace areas, but not requiring them to remain a specific distance from clouds. However, if an ATC instruction to a pilot operating an aircraft under

The amendment to reclassify TCAs as Class B airspace areas does not modify the current operating rules for communications. Lost communication requirements are addressed in paragraph 470, Two-way Radio Communications Failure, of the AIM and are not within the scope of the rulemaking.

The FAA accepted NAR 1–7.3.3—Pilot Requirements for Operations in a TCA, under the provisions of the existing requirements; hence, the reclassification of TCAs as Class B airspace areas meets existing regulations on minimum airman certificate levels. Section 61.95 of the FAR, which lists student pilot requirements for operations in a TCA (Class B airspace), is revised to meet the new airspace classification. Solo student pilot activity is, under both the existing regulations and this final rule, prohibited at certain airports.

Class C Airspace

Three comments were submitted on the reclassification of ARSAs as Class C airspace areas. None of the comments specifically support or oppose the reclassification. All of the comments, including one from EAA, addressed additional modifications.

Two commenters noted that the proposal for VFR operations in Class B airspace areas to remain clear of clouds could be applied to Class C airspace areas.

In its comment, EAA opposed any increase in the size of Class C airspace areas. Other recommendations by commenters included the need for clear radio failure procedures and the need for designated areas that do not require communications with ATC when the pilot desires to use an uncontrolled airport within Class C airspace areas.

As proposed, the FAA will reclassify ARSAs as Class C airspace areas. No other modifications to Class C airspace areas or changes in operating rules were proposed. An ARSA that currently operates on a part-time basis is classified as Class C part-time and Class D or Class E at other times.

Aircraft operating under VFR in Class C airspace areas operate under less stringent requirements than aircraft operating under VFR in Class B airspace areas and are not provided the same separation by ATC. Therefore, the relaxation of the VFR distance from cloud requirements in Class C airspace areas to remain clear of clouds would not be in accordance with safety precautions. As noted earlier, lost communication procedures are addressed in paragraph 470, Two-way Radio Communications Failure, of the AIM. Since Class C airspace areas often have a high number of aircraft that operate under IFR, a relaxation of existing communications requirements would not be in the interest of safety. Any modifications to the dimensions or operating requirements for Class C airspace areas are outside the scope of this rulemaking.

Class D Airspace

NPRM No. 89–28 proposed to reclassify control zones for airports with operating control towers and airport traffic areas, not associated with a TCA or an ARSA, as Class D airspace areas. In addition, NPRM No. 89–28 proposed to: (1) raise the ceiling to up to, and including, 4,000 feet from the surface of the airport; (2) require aircraft in Class D airspace areas to establish two-way radio communications with ATC; and (3) convert the lateral unit of measurement from statute miles to nautical miles.

One hundred and forty comments concerning the proposal to establish the ceiling of the Class D airspace areas at 4,000 feet above the surface were submitted. All of the comments opposed the proposal.

Of the 83 comments regarding the proposal to require pilots who operate in Class D airspace areas to establish two-way radio communications with ATC, two supported the proposal and 80 opposed it. One comment neither supported nor opposed the proposals.

One hundred and forty-three comments related to the proposal to convert the lateral unit of measurement of Class D airspace areas from statute to nautical miles were submitted. Most interpreted the proposal

10,000 feet MSL. ATCA stated that the proposal for two-way radio communications with ATC "erases a potentially dangerous practice and is long overdue." Another commenter suggested that a corridor could be provided in Class D airspace areas for operations at satellite airports without operating control towers.

The 140 commenters that opposed the proposed ceiling of 4,000 feet above the surface included AOPA, the Alaska Airmen's Association, the Arizona Pilots Association, EAA, the Ohio Department of Transportation, and SSA. These same organizations are represented in the 131 comments that opposed the proposed conversion from statute to nautical miles and the 80 comments that oppose the proposed two-way radio communications requirements with ATC.

Several comments, including one from EAA, were submitted on the effects of the proposed ceiling modification and communications requirements on operations under SFAR No. 51–1—Special Flight Rules in the Vicinity of Los Angeles International Airport. According to the comments, the proposal would raise the ceiling of the airport traffic areas at Santa Monica and Hawthorne Airports into the Special Flight Rules Area. The commenters also stated that the proposed two-way radio communication requirements with ATC may not allow aircraft, especially those with one radio, to listen to an advisory frequency.

Some commenters, including SSA, stated that airport traffic areas (Class D airspace) could be depicted on aeronautical charts. Several commenters, including AOPA, the Alaska Airmen's Association, EAA, and the Ohio Department of Transportation stated that the proposals would increase air traffic controller workload. Some comments, including one from AOPA, stated that the proposal would increase pilot workload or that no safety benefit exists for the proposed modifications.

Several commenters, including AOPA and EAA, requested that the ceiling of Class D airspace areas be lowered to 2,000 feet or 2,500 feet above the surface. The commenters stated that the lower altitudes are adequate for the arrival and departure of aircraft. Other commenters, including the Alaska Airmen's Association and SSA, recommended retaining the current ceiling of 3,000 feet above the surface.

Commenters stated that the proposals for modifying the size of airspace and for requiring two-way radio communications with ATC would be a burden to aircraft that fly at low altitudes, and that some aircraft would need to fly a minimum of 5,500 feet MSL as opposed to 3,500 feet MSL. Some commenters stated that the proposal would burden pilots of airplanes that do not have radios. One commenter noted that pilots who fly older aircraft with no radios or navigational aids do not pose a threat to commercial aviation.

Several comments, including those submitted by the AOPA and the Alaska Airmen's Association, stated that the proposal for two-way radio communications with ATC would not permit aircraft to listen to the common traffic advisory frequency (CTAF) of satellite airports. Additional comments, including those submitted by the AOPA and EAA, noted that air traffic controllers in control towers cannot provide effective traffic advisories for satellite airports. Some commenters, including EAA and the Ohio Department of Transportation, stated that the proposed two-way radio communication requirements with ATC are not necessary because operations at satellite airports usually do not interfere with airports with operating control towers. Another commenter noted that a pilot who desires to use a satellite airport and needs to fly near an airport with an operating control tower would need to notify the local ATC facility.

Commenters, including the Arizona Pilots Association and EAA, recommended that the lateral unit of measurement of Class D airspace areas be designated at 4 nautical miles.

As proposed, control zones for airports with operating control towers and airport traffic areas that are not associated with a TCA or an ARSA are reclassified as Class D airspace areas. After considering public comment and re-examining technical criteria, the FAA has determined that: (1) the ceiling of a Class D airspace area (designated for an airport) will normally be designated at 2,500 feet above the surface of the airport converted to mean sea level (MSL), and rounded to the nearest 100 foot increment; (2) two-way radio communications with ATC will be required; and (3) the lateral dimensions will be expressed in nautical miles rounded up to the nearest tenth of a mile. The actual lateral and

or Part 93, Special Air Traffic Rules and Airport Traffic Patterns, will be proposed under separate rulemaking actions.

Vertical Limit of Class D Airspace Areas

A goal of airspace reclassification is to enhance safety. The FAA is of the opinion that the existing airspace designations of an ARSA, which has a ceiling of "up to and including" 4,000 feet above the surface, and an airport traffic area, which has a ceiling of "up to, but not including," 3,000 feet above the surface, has caused confusion, which does not enhance safety. To promote uniformity, the FAA in NPRM No. 89–28 proposed that the ceiling of Class C, Class D, and Class E airspace areas that extend upward from the surface be established at "up to, and including" 4,000 feet above the surface. Many of the comments on this proposal were opposed to this modification. As previously stated, the FAA has determined that the ceiling of Class D airspace areas will normally be designated at up to, and including, 2,500 feet above the surface of the airport expressed in MSL. To further enhance uniformity, the ceiling of Class E airspace areas that extend upward from the surface normally will also have a ceiling established at up to, and including, 2,500 feet above the surface of the airport expressed in MSL. A ceiling of 2,500 feet above the surface will provide adequate vertical airspace to protect traffic patterns. However, the FAA emphasizes that the ceiling of a Class D or a Class E airspace area will reflect the conditions of the particular airspace area. For example, if local conditions warrant, the ceiling could be designated at more than 2,500 feet above the surface (e.g., 2,700 or 3,000 feet above the surface). Conversely, some airports with limited volume of nonturbine-powered aircraft may have a lower vertical limit.

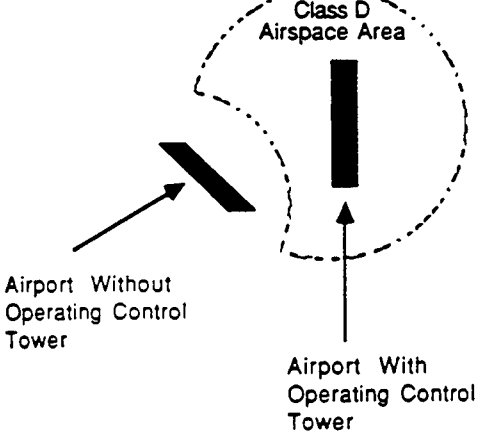
The decision to use 2,500 feet above the surface is based on recent FAA analysis of vertical airspace necessary to protect traffic patterns and a review of public comment to lower the ceiling of an airport traffic area. The FAA's analysis demonstrates that the 2000-foot vertical limit is insufficient since it often does not protect traffic patterns for high performance aircraft.

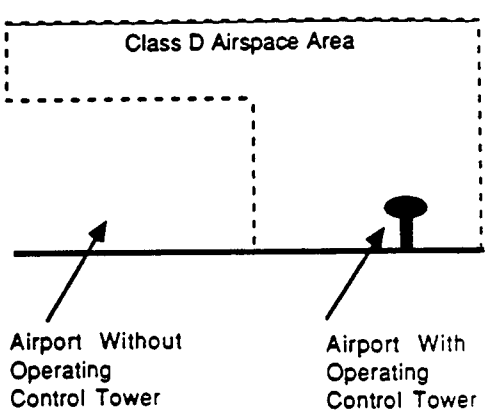
Two-Way Radio Communications in and Lateral Dimensions of Class D Airspace Areas

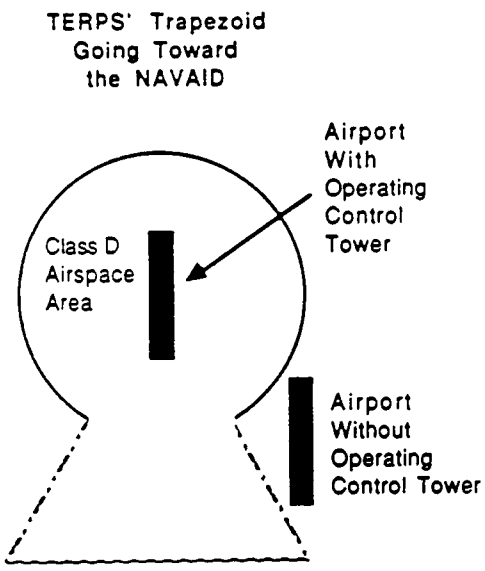
The FAA has determined that in order to meet safety standards, two-way radio communications with ATC must be established in Class D airspace areas. Task Group 1–2.3, which recommended NAR 1–2.3.2—Two-Way Radio Requirements in Airport Traffic Areas, stated that "pilots have been issued violations, or critical injuries have occurred because pilots were not in compliance with the two-way radio communications requirements."

The FAA also has determined that the lateral distance of Class D airspace areas will be based on the instrument procedures for which the controlled airspace is established. Therefore, the dimensions may not be in a circular shape that is similar to the current airport traffic areas or control zones.

Many commenters stated that the communications requirements associated with operations at satellite airports within Class D airspace areas would prevent them from using CTAF procedures. The FAA generally agrees with these comments; consequently, the FAA will individually review control zones and associated transition areas that are not associated with the primary airport of a TCA or an ARSA. The review of the designation of Class D airspace areas will be conducted to determine the necessary size of the area and will exclude satellite airports to the maximum extent practicable and consistent with safety. For example, a satellite airport without an operating control tower might have a Class E airspace area carved out of a Class D airspace area, or a Class E airspace area might be placed under a shelf of a Class D airspace area. (See Figure 1.) In another example, the portions of an existing control zone that extend beyond the existing limits of an airport traffic area (extension used for instrument approaches) may be designated only by using the airspace necessary under the terminal instrument procedures (TERPs) criteria. (See Figure 1.) When a satellite airport is excluded, a pilot who is operating an aircraft in the immediate vicinity of that satellite airport and who does not otherwise penetrate airspace where two-way radio communications with ATC are required will be free to communicate on the CTAF of that satellite airport.


Class D
Airspace Area
Airport Without
Operating Control
Tower
Airport With
Operating Control
Tower


Class D Airspace Area
Airport Without
Operating
Control Tower
Airport With
Operating
Control Tower


TERPS' Trapezoid
Going Toward
the NAVAID
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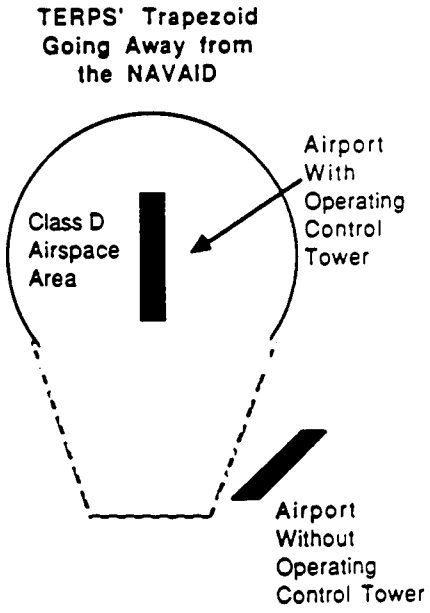
TERPS' Trapezoid
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towers, transition areas, and area low routes. The five comments submitted on this proposal neither supported nor opposed the proposal, but offered suggestions.

One commenter noted that the current names are descriptions of how the airspace area is to be used (i.e., transition areas, airways) and that under the proposal, airways would still be necessary. The SSA recommended the continued use of the term "control zone" for airspace extending upward from the surface that is independent of Class B, Class C, or Class D airspace areas. They also recommended that control zones should extend to the floor of overlying controlled airspace. One commenter recommended that the floor of Class E airspace areas that are now 1,200 feet above ground level (AGL) be raised to 1,500 or 2,200 feet AGL and noted that the floor of Class E airspace areas should not be below the minimum en route IFR altitude (MEA) in mountainous regions.

The FAA will adopt the classification of Class E airspace areas as proposed. This classification will not eliminate the requirement for Federal airways, which are specified in Part 71. However, this classification will eliminate the designation of control zones. Control zones for airports without operating control towers are classified as Class E airspace areas designated for an airport that extend upward from the surface.

The FAA believes that the reclassification of control zones for airports without operating control towers as Class E airspace areas will not cause confusion. As noted earlier, such airspace areas will be depicted on visual aeronautical charts by a segmented magenta line. Under existing regulations, a control zone usually has a 5-statute mile radius and ascends to the base of the Continental Control Area. The FAA's review process, using the revised criteria in FAA Order 7400.2C, will look at the dimensions of each control zone and associated transition areas. Each review will include a review of instrument approach procedures, as well as local terrain to determine the actual airspace needed to contain IFR operations.

The floor of Class E airspace areas, which do not extend upward from the surface, will remain the same as existing airspace areas (e.g., 700 feet AGL, 1,200 feet AGL, 1,500 feet AGL, 14,500 feet MSL). Any modifications to the floor of Class E airspace areas are beyond the scope of this rulemaking.

Class G Airspace

NPRM No. 89–28 proposed to reclassify airspace that is not otherwise designated as the Continental Control Area, a control area, a control zone, a terminal control area, a transition area, or SUA as Class G airspace areas. Of the six comments submitted, four comments opposed the proposal and two offered suggestions.

The four opposing comments, including EAA's comment, understood the Class G airspace areas to be airspace below 700 feet AGL.

The two comments that neither supported nor opposed the proposal included the comment from the ATA. The ATA recommended that Class G airspace areas be designated as Class F airspace areas.

The FAA has determined that all navigable airspace areas not otherwise designated as Class A, Class B, Class C, Class D, or Class E airspace areas or SUA are classified as Class G airspace areas. Since the proposal to replace the Continental Control Area with the U.S. control area in NPRM No. 88–2 was not adopted, the vertical limit of Class G airspace areas will vary (e.g., 700 feet AGL, 1,200 feet AGL, 1,500 feet AGL, 14,500 feet MSL). In addition, the flight visibility and distance from cloud requirements for operations under VFR proposed in NPRM No. 89–28 are modified to remain consistent with the existing requirements in §§ 91.155 and 103.23.

Class F airspace is omitted from the U.S. airspace classifications because this airspace, as adopted by ICAO, does not have a U.S. equivalent. Class G airspace, as adopted by ICAO, is the equivalent of U.S. uncontrolled airspace.

designations could be specified without following rulemaking procedures where required. Further review of airspace areas will be proposed in future FAA rulemaking actions.

Three commenters, including the Alaska Airmen's Association and SSA, noted that NPRM No. 89–28 proposed to define controlled airspace in FAR § 1.1 as airspace in which "all aircraft may be subject to ATC" rather than airspace in which "some or all aircraft may be subject to ATC." According to one commenter, because aircraft operating under VFR are not always subject to ATC in controlled airspace, especially Class E airspace, the current definition is more accurate.

The proposed definition of controlled airspace is adopted in essence but it has been modified to correspond with ICAO's definition of a controlled airspace. Subsequent to the publication of NPRM No. 89–28, ICAO modified its definition of controlled airspace to read as follows: "*Controlled airspace.* An airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification. Note—Controlled airspace is a generic term which covers ATS [air traffic services] in airspace Classes A, B, C, D, and E." The proposed FAA definition in NPRM No. 89–28 read: "*Controlled airspace* means airspace designated as Class A, Class B, Class C, Class D, or Class E airspace in Part 71 of this chapter and within which all aircraft may be subject to air traffic control."

While the commenter is essentially correct that all aircraft are not always subject to air traffic control, any aircraft may be subject to ATC if the pilot operates under IFR or if the pilot requests and receives air traffic services. The FAA believes that misunderstandings would be minimized with the adoption of the ICAO definition. The ICAO definition and the proposed definition are essentially synonymous; however, the FAA is confident the adoption of the ICAO definition is consistent with the objectives of airspace reclassification and that it is beneficial to have a common international definition of controlled airspace.

Four commenters, including EAA and SSA, noted that NPRM No. 89–28 only permits Special VFR operations for the purposes of departing from or arriving at an airport. The commenters stated that such a restriction of Special VFR operations would affect pipeline patrol, aerial photography, law enforcement, agricultural, and other special types of operations. EAA also stated that the proposed limitation of 4,000 feet above the surface for Special VFR operations could prevent pilots from climbing to the top of a haze layer.

The FAA will continue to permit Special VFR operations for through flights as well as flights for arrival or departure. Because control zones will be eliminated under Airspace Reclassification, Special VFR operations are only permitted within the ceiling and lateral boundaries of the surface areas of the Class B, Class C, Class D, or Class E airspace designated for an airport. Because the proposal for a uniform ceiling for Class C, Class D, and Class E airspace areas at 4,000 feet above the surface is not adopted, the boundaries of the airspace area in which Special VFR operations are permitted will vary. For example, if a Class C airspace area has a ceiling designated at 4,500 feet MSL and a surface area designated within a 5-nautical mile radius from the airport, Special VFR operations are permitted within that 5-nautical mile radius up to and including 4,500 feet MSL.

One commenter, a flight instructor with a petition signed by additional flight instructors, stated that the language in the proposal on aerobatic flight is vague and could be interpreted to restrict aerobatic operations within existing transition areas and other less crowded airspace areas. The commenter was concerned that the proposed § 91.71(c) could affect spin training at flight schools.

Under this amendment, the term "control zone" will be eliminated. However, the FAA desires to continue restrictions that currently exist in the FAR on operations within control zones. These restrictions will now apply within the lateral boundaries of the surface areas of the Class B, Class C, Class D, or Class E airspace designated for an airport. For example, if a Class E airspace area is designated to extend upward from the surface with a 4.4-nautical mile radius from the airport and a ceiling of 2,600 feet MSL, aerobatic flight will not be permitted below 2,600 feet MSL within a 4.4-nautical mile radius of the airport.

7400.2C and the reviews occur before the effective date of the Airspace Reclassification final rule, the revised criteria are written in existing airspace terminology. Examples of the revised criteria include: (1) converting the lateral unit of measurement from statute miles to nautical miles; (2) conforming existing control zones to be congruent with the lateral dimensions of the surface areas of existing TCAs or ARSAs; (3) redesignating control zones to contain intended operations (not necessarily in a circular configuration); (4) redesignating the vertical limit of control zones from the surface of the earth to a specified altitude (but not to the base of the Continental Control Area); (5) establishing a policy to exclude satellite airports from control zones to the maximum extent practicable, consistent with instrument procedures and safety; and (6) replacing control zone departure extensions with transition areas.

The FAA anticipates that many control zones and associated transition areas would require minor modification. For example, a control zone could be integrated with the associated TCA or ARSA (Class B or Class C airspace area) or a control zone could become either a Class D airspace area or a Class E airspace area that extends upward from the surface.

The reviews will include control zones where a significant change in the current airspace structure is expected. For example, a control zone that extends beyond the perimeter of the associated TCA or ARSA and could require modification of the associated TCA or ARSA (Class B or Class C airspace area). The reviews will also include transition areas not associated with control zones and offshore airspace. Proposed changes that result from these reviews will be promulgated using normal rulemaking procedures.

The reviews could also result in the expansion of controlled airspace. These actions could affect airspace areas associated with non-Federal control towers. Any expansion of controlled airspace will be proposed in future NPRMs.

All necessary changes to the airspace structures are scheduled to be completed by September 16, 1993, the effective date of the Airspace Reclassification final rule.

Changes to the NPRM

This final rule includes several nonsubstantive editorial changes made to NPRM No. 89–28. Changes are also included in this final rule to certain FAR sections that were not included in NPRM No. 89–28 but require changes in terminology to be consistent with the amendments. Three additional subparts in Part 93 are deleted because the rules will not be necessary under airspace reclassification. The sections and subparts, with an explanation of the changes made to them, follow.

SFAR 51–1: The reference to "Terminal Control Area (TCA)" in Section 1 is replaced with "Class B airspace area." The reference to § 91.105(a) in Section 2(a) is replaced with § 91.155(a). The reference to § 91.24(b) in Section 2(b) is replaced with § 91.215(b). The phrase "meet the equipment requirements" in Section 2(b) is replaced with "be equipped as." The reference to § 91.90(a) and § 91.90 in Section 3 is replaced with § 91.131(a) and § 91.131.

SFAR 60: The references to "terminal control area" and "airport radar service area" in Section 3a are replaced with "Class B airspace area" and "Class C airspace area." The phrase "terminal and en route airspace" in Section 3a is replaced with "class of controlled airspace."

SFAR 62: The two references to "terminal control area" in Section 1(a) are replaced with "Class B airspace area." The references to the "Tri-Area TCA" in Section 2(24) and (25) are replaced with "Tri-Area Class B airspace area."

§ 45.22(a)(3)(i): The phrase "the designated airport control zone of the takeoff airport, or within 5 miles of that airport if it has no designated control zone" is replaced with "the lateral boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for the takeoff airport, or within 4.4 nautical miles of that airport if it is within Class G airspace."

§ 61.95: All references to "terminal control area" in the title and paragraphs (a), (a)(1), (a)(2), (a)(3), and (b) are replaced with "Class B airspace" or "Class B airspace area."

§ 91.905: The references to §§ 91.127, 91.129, 91.130, 91.131, and 91.135 are replaced with the titles to become effective September 16, 1993, and a reference is added to § 91.126.

§ 93.1(b): The reference to § 93.113, which is to be deleted as of September 16, 1993, is deleted.

Subpart N, Part 93: This subpart on the airport traffic area at the Sabre U.S. Army Heliport (Tennessee) is removed and reserved. On September 16, 1993, this airspace will become a Class D airspace area.

Subpart O, Part 93: This subpart on the Navy airport traffic area at Jacksonville, Florida, is removed and reserved. On September 16, 1993, this airspace will become three separate but adjoining Class D airspace areas.

Subpart R, Part 93: This subpart on the Special Air Traffic Rules at El Toro, California, is removed and reserved. On September 16, 1993, this airspace will become a part of the El Toro Class C airspace area.

§ 135.205(b): The reference to "uncontrolled airspace" is replaced with "Class G airspace." The reference to "control zones" is replaced with "within the lateral boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for an airport."

§ 139.323(a): The reference to "terminal control area" is replaced with "Class B airspace area."

§ 171.9(e)(1) and (e)(2): All references to "air traffic control areas" are replaced with "controlled airspace."

§ 171.29(d)(1) and (d)(2): All references to "air traffic control areas" are replaced with "controlled airspace."

§ 171.159(e)(1) and (e)(2): Both references to "air traffic control areas" are replaced with "controlled airspace." The reference to "air traffic control zones or areas" is replaced with "controlled airspace."

§ 171.209(d): Both references to "air traffic control areas" are replaced with "controlled airspace." The reference to "air traffic control zones or areas" is replaced with "controlled airspace."

§ 171.323(i): The reference to "air traffic control areas" is replaced with "controlled airspace." The reference to "air traffic control zones or areas" is replaced with "controlled airspace."

Obsolete Dates

Obsolete dates have been removed from §§ 91.215(b)(2), (b)(4), and (b)(5)(ii). Section 91.215(b)(5)(i)(A) is obsolete and is deleted. Section 91.215(b)(5)(i)(B) is incorporated into existing § 91.215(b)(5)(i).

Regulatory Evaluation Summary

This section summarizes the full regulatory evaluation prepared by the FAA that provides more detailed estimates of the economic consequences of this final rule regulatory action. This summary and the full evaluation quantify, to the extent practicable, estimated costs to the private sector, consumers, Federal, State and local governments, as well as anticipated benefits.

Executive Order 12291, dated February 17, 1981, directs Federal agencies to promulgate new regulations or modify existing regulations only if potential benefits to society for each regulatory change outweigh potential costs. The order also requires the preparation of a Regulatory Impact Analysis of all major rules except those responding to emergency situations or other narrowly defined exigencies. A major rule is one that is likely to result in an annual effect on the economy of $100 million or more, a major increase in consumer costs, a significant adverse effect on competition, or one that is highly controversial.

The FAA has determined that this rule is not major as defined in the executive order. Therefore, a full regulatory *analysis*, that includes the identification and evaluation of cost reducing alternatives

designations, standardize equipment requirements and associate appropriate pilot certification requirements as well as certain other requirements associated with each proposed airspace designation. These changes are based primarily on recommendations from a National Airspace Review (NAR) task group and will ultimately allow for increased safety and efficiency in the U.S. airspace and air traffic control system.

Costs

The FAA estimates the total incremental cost that will accrue from the implementation of this final rule to be $1.9 million (discounted, in 1990 dollars). Virtually all cost, which is expected to be incurred by the FAA, will accrue from revisions to aeronautical charts, re-education of the pilot community, and revision of air traffic controller training courses. Each one of these factors is briefly discussed below:

1. Revisions to Aeronautical Charts

A significant cost impact associated with this rule will result from the requirement to change aeronautical charts. These modifications will be incorporated during the regular updating and printing of the charts. Therefore, all costs associated with printing aeronautical charts are assumed to be normal costs of doing business. However, because of dimension and symbol changes that will be needed, the plates used to print the charts will need to be changed, and this will affect most of the aeronautical charts printed.

The total cost of revisions to all charts is estimated by the National Ocean Service based on the summation of the costs of revising each class of the airspace. The total discounted cost is estimated to be $1.2 million.

2. Revision of Air Traffic Training Courses

Manuals, textbooks, and other training materials used to educate FAA controllers will need to be updated to reflect the airspace reclassification. According to the FAA Aeronautical Center in Oklahoma City, lesson plans, visual aids, handouts, laboratory exercises, and tests will need to be revised.

The cost of these revisions is determined by multiplying the total revision time by the hourly cost of the course manager making the changes. The course managers are level GS-14 (step 5) employees with an average loaded annual salary of $72,000. Assuming 2,080 hours per year, their average loaded hourly salary is $35. The cost of the course changes is estimated to be $43,000 (discounted). An additional cost of $10,000 (discounted) will accrue as the result of a one-week seminar and associated travel. This seminar will be necessary to educate course managers about the airspace reclassification. The total cost that will accrue from this factor is estimated to be $43,000 (discounted).

3. Re-education of the Pilot Community

Pilots who are presently certificated to operate in the U.S. airspace will need to become familiar with the airspace reclassification as the result of this rule. This task will be accomplished through a variety of publications, videotapes, and pilot meetings.

The FAA is considering the production of a videotape that will be provided as a public service to industry associations, such as AOPA, ALPA, and NBAA, to inform them of the airspace reclassification. This videotape could be shown at various association meetings to help re-educate the pilot community. The FAA's Office of Public Affairs estimates that the film will be 20 to 25 minutes long and could be produced at a cost of $75,000 (discounted).

The FAA is also considering the publication of an advisory circular (AC) which will document the new airspace classifications. The AC will be mailed to each registered pilot. It is estimated that one man-week at a level GS-14 (Step 5) will be required to draft the AC and obtain approval in the sponsoring organization, and one GS-14 man-week will be required to obtain FAA approval of the AC. The cost associated with 2 man-weeks at a level GS-14 needed to prepare the AC is estimated

This final rule is expected to generate benefits in the form of enhanced safety and operational efficiency to the aviation community. These benefits are briefly described, in qualitative terms, below:

1. Increased Safety Due to Better Understanding and Simplification

The FAA believes that the simplified classification in this rule will reduce airspace complexity and thereby enhance safety. This airspace reclassification mirrors the new ICAO airspace designations, except there will not be a U.S. Class F airspace.

This rule also will increase safety in the U.S. since foreign pilots operating aircraft in U.S. airspace will be familiar with the airspace designations and classification system.

Another simplification which is expected to help increase airspace safety is the change that will correlate the class of controlled airspace currently termed a control zone to the airspace of the surrounding area. Currently, several types of airspace are designated around an airport, which makes it difficult for pilots and controllers to determine how the areas are classified and which requirements apply. After the reclassification, the terminology will be more explanatory.

The conversion of statute mile designations to nautical mile designations is intended to further simplify operations. Since the instruments on-board the aircraft are calibrated in nautical miles and aviation charts have representations in nautical miles, this change will eliminate the need for pilots to convert between nautical and statute miles. This simplification will help pilots and controllers to be better able to understand the airspace designations in Part 71.

2. Reduced Minimum Distance from Cloud Requirement

This airspace reclassification will designate TCAs as Class B airspace areas. The VFR minimum distance from clouds requirement in this airspace will also change. Currently this distance is 500 feet below, 1,000 feet above, and 2,000 feet horizontal. In Class B airspace, the rule will require that the minimum distance from clouds be "clear of clouds." This change will afford VFR traffic increased opportunities to fly in Class B airspace in more types of weather than they currently have in a TCA. Furthermore, there will be reduced requests for deviation from ATC instruction to maintain cloud clearance. This action will not threaten safety since all aircraft operating in Class B airspace are provided with the appropriate separation.

3. Operation Of Ultralight Vehicles

This rule incorporates NAR task group 1–7.2 recommendations and changes Part 103 to correspond to the new airspace designations found in Part 71. There will be no decrease in safety because there is not change in the type of airspace in which ultralights are permitted to fly or operate.

Conclusion

Despite the fact that benefits are *not* quantifiable in monetary terms, the FAA, nonetheless, concludes that the benefits of this rule are expected to outweigh its expected costs.

International Trade Impact Assessment

Since this rule will not affect airspace outside the United States for which the United States is responsible, it is not expected to impose any new operating requirement in that airspace. As such, it will have no affect on the sale of foreign aviation products or services in the United States, nor will it affect the sale of U. S. products or services in foreign countries.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by government regulations. The RFA requires agencies

FEDERALISM IMPLICATIONS

The amendments in this final rule will not have substantial direct effect on the States, on the relationship between the National Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that these amendments will not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

PAPERWORK REDUCTION ACT

In accordance with the Paperwork Reduction Act of 1980 (Pub L. 96-511), there are no requirements for information collection associated with this rule.

CONCLUSION

For reasons discussed in the preamble, and based on the findings in the Regulatory Evaluation Determination and the International Trade Impact Analysis, the FAA has determined that these amendments do not qualify as a major rule under Executive Order 12291. In addition, the FAA certifies that these amendments will not have a significant economic effect on a substantial number of small business entities under the criteria of the Regulatory Flexibility Act. These amendments are considered significant under DOT Regulatory Policies and Procedures (44 FR 11034; February 26, 1979). A regulatory evaluation of these amendments, including a Regulatory Flexibility Determination and Trade Impact Analysis, has been placed in its entirety in the regulatory docket. A copy may be obtained by contacting the person identified under *"FOR FURTHER INFORMATION CONTACT."*

CROSS REFERENCE

To identify where existing regulations for Part 75 are relocated in existing Part 71, the following cross reference lists are provided:

CROSS REFERENCE TABLE

Old Section	New Section
75.1	71.601
75.11	71.603
75.13	71.605
75.17	Deleted
75.100	71.607
75.400	71.609

New Section	Old Section
71.601	75.1
71.603	75.11
71.605	75.13
71.607	75.100
71.609	75.400

To identify where existing regulations for Part 71 are relocated in the rule to be effective September 16, 1993, or if the regulations will be relocated in FAA Order 7400.9, the following cross reference lists are provided:

71.9	71.71
71.11	Deleted
71.12	71.41
71.13	71.71
71.14	71.51
71.15	71.31
71.17	71.5
71.19	71.7
71.101	Subpart E of FAA Order 7400.9
71.103	Subpart E of FAA Order 7400.9
71.105	Subpart E of FAA Order 7400.9
71.107	Subpart E of FAA Order 7400.9
71.109	Subpart E of FAA Order 7400.9
71.121	71.79
71.123	Subpart E of FAA Order 7400.9
71.125	Subpart E of FAA Order 7400.9
71.127	Subpart E of FAA Order 7400.9
71.151	Subpart E of FAA Order 7400.9
71.161	71.71 and Subpart E of FAA Order 7400.9
71.163	71.71 and Subpart E of FAA Order 7400.9
71.165	Subpart E of FAA Order 7400.9
71.171	Subpart D or E of FAA Order 7400.9
71.181	Subpart E of FAA Order 7400.9
71.193	71.33
71.201	71.901
71.203	Subpart H of FAA Order 7400.9
71.207	Subpart H of FAA Order 7400.9
71.209	Subpart H of FAA Order 7400.9
71.211	Subpart H of FAA Order 7400.9
71.213	Subpart H of FAA Order 7400.9
71.215	Subpart H of FAA Order 7400.9
71.301	Subpart E of FAA Order 7400.9
71.401	Subpart B of FAA Order 7400.9
71.501	Subpart C of FAA Order 7400.9
71.601	Deleted
71.603	Subpart A of FAA Order 7400.9
71.605	Subpart A of FAA Order 7400.9
71.607	Subpart A of FAA Order 7400.9
71.609	Subpart A of FAA Order 7400.9

New Section	**Old Section**
71.1	71.1
71.5	71.17
71.7	71.19
71.9	New
71.31	71.15
71.33	71.193
71.41	71.12
71.51	71.14
71.61	New
71.71	71.9, 71.13, 71.161, 71.163
71.73	71.3
71.75	71.5
71.77	71.6
71.79	71.121
71.901	71.201

Subpart D or Subpart E	71.171
Subpart E	71.101
Subpart E	71.103
Subpart E	71.105
Subpart E	71.107
Subpart E	71.109
Subpart E	71.123
Subpart E	71.125
Subpart E	71.127
Subpart E	71.151
Subpart E	71.161
Subpart E	71.163
Subpart E	71.165
Subpart E	71.181
Subpart E	71.301
Subpart H	71.203
Subpart H	71.207
Subpart H	71.209
Subpart H	71.211
Subpart H	71.213
Subpart H	71.215

The Rule

In consideration of the foregoing, the Federal Aviation Administration amends SFAR 51-1, SFAR 60, SFAR 62, Parts 1, 11, 45, 61, 65, 71, 75, 91, 93, 101, 103, 105, 121, 127, 135, 137, 139, and 171 of Federal Aviation Regulations (14 CFR Parts 1, 11, 45, 61, 65, 71, 75, 91, 93, 101, 103, 105, 121, 127, 135, 137, 139, and 171).

The authority citation for Part 171 is revised to read as follows:

Authority: 49 U.S.C. App. 1343, 1346, 1348, 1354(a), 1355, 1401, 1421 through 1430, 1472(c), 1502, and 1522; 49 U.S.C. 106(g).

Source: Docket No. 5034, (29 FR 11337) August 6, 1964, unless otherwise noted.

§ 171.1 Scope.

This subpart sets forth minimum requirements for the approval and operation on non-Federal VOR facilities that are to be involved in the approval of instrument flight rules and air traffic control procedures related to those facilities.

(Amdt. 171–2, Eff. 5/30/66); (Amdt. 171–7, Eff. 9/9/70)

§ 171.3 Requests for IFR procedure.

(a) Each person who requests an IFR procedure based on a VOR facility that he owns must submit the following information with that request:

(1) A description of the facility and evidence that the equipment meets the performance requirements of § 171.7 and is installed in accordance with § 171.9.

(2) A proposed procedure for operating the facility.

(3) A proposed maintenance organization and maintenance manual that meets the requirements of § 171.11.

(4) A statement of intention to meet the requirements of this subpart.

(5) A showing that the facility has an acceptable level of operational reliability and an acceptable standard of performance. Previous equivalent operational experience with a facility with identical design and operational characteristics will be considered in showing compliance with this paragraph.

(b) After the FAA inspects and evaluates the facility, it advises the owner of the results and of any required changes in the facility or the maintenance manual or maintenance organization. The owner must then correct the deficiencies, if any, and operate the facility for an in-service evaluation by the FAA.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.5 Minimum requirements for approval.

(a) The following are the minimum requirements that must be met before the FAA will approve an IFR procedure for a non-Federal VOR:

(1) The facility's performance, as determined by air and ground inspection, must meet the requirements of § 171.7.

(2) The installation of the equipment must meet the requirements of § 171.9.

(3) The owner must agree to operate and maintain the facility in accordance with § 171.11.

(4) The owner must agree to furnish periodic reports, as set forth in § 171.13, and must agree to allow the FAA to inspect the facility and its operation whenever necessary.

(5) The owner must assure the FAA that he will not withdraw the facility from service without the permission of the FAA.

(6) The owner must bear all costs of meeting the requirements of this section and of any flight or ground inspections made before the facility is commissioned, except that the Federal Aviation Administration may bear certain of these costs subject to budgetary limitations and policy established by the Administrator.

(b) If the applicant for approval meets the requirements of paragraph (a) of this section, the FAA commissions the facility as a prerequisite to its approval for use in an IFR procedure. The approval is withdrawn at any time the facility does not continue to meet those requirements.

(Amdt. 171–6, Eff. 7/24/70)

§ 171.7 Performance requirements.

(a) The VOR must perform in accordance with the "International Standards and Recommended Practices, Aeronautical Telecommunications," Part I, paragraph 3.3 (Annex 10 to the Convention on International Civil Aviation), except that part of paragraph 3.3.2.1 specifying a radio frequency tolerance of 0.005 percent, and that part of paragraph 3.3.7 requiring removal of only the bearing information. In place thereof, the frequency tolerance of

deterioration.

(c) The monitor is checked periodi- cally, during the in-service test evaluation period, for calibration and stability The tests are made with a standard "Reference and variable phase signal generator" and associated test equipment, including an oscilloscope and portable field detector. In general, the ground check is conducted in accordance with section 8.4 of FAA Handbook AF P 6790.9 "Maintenance Instruction for VHF Omniranges", adapted for the facility concerned.

(d) Flight tests to determine the facility's adequacy for operational requirements and compliance with applicable "Standards and Recommended Practices" are conducted in accordance with the "U.S. Standard Flight Inspection Manual", particularly section 201.

(e) After January 1, 1975, the owner of the VOR shall modify the facility to perform in accordance with paragraph 3.3.5.7 of Annex 10 to the Convention on International Civil Aviation within 180 days after receipt of notice from the Administrator that 50 kHz channel spacing is to be implemented in the area and that a requirement exists for suppression of 9960 Hz subcarrier harmonics.

(Amdt. 171–7, Eff. 9/9/70); (Amdt. 171–9, Eff. 11/19/73)

§ 171.9 Installation requirements.

(a) The facility must be installed according to accepted good engineering practices, applicable electric and safety codes, and the installation must meet at least the Federal Communication Commission's licensing requirements.

(b) The facility must have a reliable source of suitable primary power, either from a power distribution system or locally generated, with a supplemental standby system, if needed.

(c) Dual transmitting equipment with automatic changeover is preferred and may be required to support certain IFR procedures.

(d) There must be a means for determining, from the ground, the performance of the equipment, including the antenna, initially and periodically.

channels are acceptable.

(2) At facilities within or immediately adjacent to air traffic control areas, there must be the ground-air communications required by paragraph (e)(1) of this section and reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communication facility.

Paragraphs (e) (1) and (2) of this section are not mandatory at airports where an adjacent FAA facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition at low traffic density airports within or immediately adjacent to air traffic control areas, and where extensive delays are not a factor, the requirements of paragraphs (e) (1) and (2) of this section may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communication facility, if an adjacent FAA facility can communicate with aircraft during the proposed instrument approach procedure, at least down to the minimum en route altitude of the controlled area.

[(1) At facilities outside of and not immediately adjacent to controlled airspace, there must be ground-air communications from the airport served by the facility. Separate communications channels are acceptable.]

[(2) At facilities within or immediately adjacent to controlled airspace, there must be the ground-air communications required by paragraph (e)(1) of this section and reliable communications (at least a landline telephone) form the airport to the nearest FAA air traffic control or communication facility.

[Paragraphs (e)(1) and (2) of this section are not mandatory at airports where an adjacent FAA facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition at low traffic density airports within or immediately adjacent to controlled airspace and where extensive delays are not a factor, the requirements of paragraphs (e)(1) and (2) of this section may

9/16/93)]

§ 171.11 Maintenance and operations requirements.

(a) The owner of the facility must establish an adequate maintenance system and provide qualified maintenance personnel to maintain the facility at the level attained at the time it was commissioned. Each person who maintains a facility must meet at least the Federal Communications Commission's licensing requirements and show that he has the special knowledge and skills needed to maintain the facility including proficiency in maintenance procedures and the use of specialized test equipment.

(b) The owner must prepare, and obtain FAA approval of, an operations and maintenance manual that sets forth mandatory procedures for operations, preventive maintenance, and emergency maintenance, including instructions on each of the following:

(1) Physical security of the facility.

(2) Maintenance and operations by authorized persons only.

(3) FCC licensing requirements for operating and maintenance personnel.

(4) Posting of licenses and signs.

(5) Relations between the facility and FAA air traffic control facilities, with a description of the boundaries of controlled airspace over or near the facility, instructions for relaying air traffic control instructions and information (if applicable), and instructions for the operation of an air traffic advisory service if the VOR is located outside of controlled airspace.

(6) Notice to the Administrator of any suspension of service.

(7) Detailed and specific maintenance procedures and servicing guides stating the frequency of servicing.

(8) Air-ground communications, if provided, expressly written or incorporating appropriate sections of FAA manuals by reference.

shutdowns (private use facilities may omit the "Notices to Airmen").

(14) An explanation of the kinds of activity (such as construction or grading) in the vicinity of the facility that may require shutdown or recertification of the facility by FAA flight check.

(15) Procedures for conducting a ground check of course accuracy.

(16) Commissioning of the facility.

(17) An acceptable procedure for amending or revising the manual.

(18) The following information concerning the facility:

(i) Location by latitude and longitude to the nearest second, and its position with respect to airport layouts.

(ii) The type, make, and model of the basic radio equipment that will provide the service.

(iii) The station power emission and frequency.

(iv) The hours of operation.

(v) Station identification call letters and method of station identification, whether by Morse code or recorded voice announcement, and the time spacing of the identification.

(vi) A description of the critical parts that may not be changed, adjusted, or repaired without an FAA flight check to confirm published operations.

(c) The owner shall make a ground check of course accuracy each month in accordance with procedures approved by the FAA at the time of commissioning, and shall report the results of the checks as provided in § 171.13.

(d) If the owner desires to modify the facility, he must submit the proposal to the FAA and may not allow any modifications to be made without specific approval.

(e) The owner's maintenance personnel must participate in initial inspections made by the FAA. In the case of subsequent inspections, the owner or his representative shall participate.

(f) Whenever it is required by the FAA, the owner shall incorporate improvements in VOR maintenance brought about by progress in the state

(Amdt. 171–2, Eff. 5/30/66)

§ 171.13 Reports.

The owner of each facility to which this subpart applies shall make the following reports on forms furnished by the FAA, at the times indicated, to the FAA Regional office for the area in which the facility is located:

(a) *Record of meter readings and adjustments (Form FAA–198).* To be filled out by the owner with the equipment adjustments and meter readings as of the time of commissioning, with one copy to be kept in the permanent rec- ords of the facility and two copies to the appropriate Regional office of the FAA. The owner shall revise the form after any major repair, modernization, or returning, to reflect an accurate record of facility operation and adjustment.

it is prepared.

(c) *Radio equipment operation record (Form FAA–418).* To contain a complete record of meter readings, recorded on each scheduled visit to the facility. The owner shall keep the original of each month's record at the facility and send a copy of it to the appropriate Regional office of the FAA.

(d) [Reserved]

(e) *VOR ground check error data (Forms FAA–2396 and 2397).* To contain results of the monthly course accuracy ground check in accordance with FAA Handbook AF P 6790.9 ''Maintenance Instructions for VHF Omniranges''. The owner shall keep the originals in the facility and send a copy of each form to the appropriate Regional office of the FAA on a monthly basis.

(49 U.S.C. 1348)

(Amdt. 171–5, Eff. 9/30/69); (Amdt. 171–10, Eff. 8/19/75)

for the approval and operation of non-Federal, nondirectional radio beacon facilities that are to be involved in the approval of instrument flight rules and air traffic control procedures related to those facilities.

(b) A nondirectional radio beacon (''H'' facilities domestically—NDB facilities internationally) radiates a continuous carrier of approximately equal intensity at all azimuths. The carrier is modulated at 1020 cycles per second for station identification purposes.

(Amdt. 171–2, Eff. 5/30/66); (Amdt. 171–7, Eff. 9/9/70)

§ 171.23 Requests for IFR procedure.

(a) Each person who requests an IFR procedure based on a nondirectional radio beacon facility that he owns must submit the following information with that request:

(1) A description of the facility and evidence that the equipment meets the performance requirements of § 171.27 and is installed in accordance with § 171.29.

(2) A proposed procedure for operating the facility.

(3) A proposed maintenance arrangement and a maintenance manual that meets the requirements of § 171.31.

(4) A statement of intention to meet the requirements of this subpart.

(5) A showing that the facility has an acceptable level of operational reliability and an acceptable standard of performance. Previous equivalent operational experience with a facility with identical design and operational characteristics will be considered in showing compliance with this subparagraph.

(b) After the FAA inspects and evaluates the facility, it advises the owner of the results and of any required changes in the facility or the maintenance manual or maintenance organization. The owner must then correct the deficiencies, if

(Amdt. 171–7, Eff. 9/9/70)

§ 171.25 Minimum requirements for approval.

(a) The following are the minimum requirements that must be met before the FAA will approve an IFR procedure for a non-Federal, nondirectional radio beacon facility under this subpart:

(1) The facility's performances, as determined by air and ground inspection, must meet the requirements of § 171.27.

(2) The installation of the equipment must meet the requirements of § 171.29.

(3) The owner must agree to operate and maintain the facility in accord- ance with § 171.31.

(4) The owner must agree to furnish periodic reports, as set forth in § 171.33, and agree to allow the FAA to inspect the facility and its operation whenever necessary.

(5) The owner must assure the FAA that he will not withdraw the facility from service without the permission of the FAA.

(6) The owner must bear all costs of meeting the requirements of this section and of any flight or ground inspections made before the facility is commissioned, except that the Federal Aviation Administration may bear certain of these costs subject to budgetary limitations and policy established by the Administrator.

(b) If the applicant for approval meets the requirements of paragraph (a) of this section, the FAA commissions the facility as a prerequisite to its approval for use in an IFR procedure. The approval is withdrawn at any time the facility does not continue to meet those requirements. In addition, the facility may be de-commissioned whenever the frequency channel is needed for higher priority common system service.

(Amdt. 171–6, Eff. 7/24/70)

§ 171.27 Performance requirements.

(a) The facility must meet the performance requirements set forth in the ''International Stand-

ing practices for the desired service.

(c) Ground inspection consists of an examination of the design features of the equipment to determine (based on recognized and accepted good engineering practices) that there will not be conditions that will allow unsafe operations because of component failure or deterioration.

(d) Flight tests to determine the facility's adequacy for operational requirements and compliance with applicable "Standards and Recommended Practices" are conducted in accordance with the "U.S. Standard Flight Inspection Manual", particularly section 207. The original test is made by the FAA and later tests shall be made under arrangements, satisfactory to the FAA, that are made by the owner.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.29 Installation requirements.

(a) The facility must be installed according to accepted good engineering practices, applicable electric and safety codes, and FCC licensing requirements.

(b) The facility must have a reliable source of suitable primary power.

(c) Dual transmitting equipment may be required to support some IFR procedures.

(d) A facility intended for use as an instrument approach aid for an airport must have or be supplemented by (depending on the circumstances) the following ground-air or landline communications services:

(1) At facilities outside of and not immediately adjacent to air traffic control areas, there must be ground-air communications from the airport served by the facility. Voice on the aid controlled from the airport is acceptable.

(2) At facilities within or immediately adjacent to air traffic control areas, there must be the ground-air communications required by paragraph (d)(1) of this section and reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communication facility.

reduced to reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communications facility, if an adjacent FAA facility can communicate with aircraft during the proposed instrument approach procedure, at least down to the minimum en route altitude of the controlled area.

[(1) At facilities outside of and not immediately adjacent to contorlled airspace, there must be ground-air communications from the airport served by the facility. Voice on the aid controlled from the airport is acceptable.]

[(2) At facilities within or immediately adjacent to controlled airspace, there must be the ground-air communications required by paragraph (d)(1) of this section and reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communication facility.

[Paragraphs (d) (1) and (2) of this section are not mandatory at airports where an adjacent FAA facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to controlled airspace, and where extensive delays are not a factor, the requirements of paragraphs (d)(1) and (2) of this section may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communications facility, if an adjacent FAA facility can communicate with aircraft during the proposed instrument approach procedure, at least down to the minimum en route altitude of the controlled area.]

[(Amdt. 171–16, Eff. 9/16/93)]

§ 171.31 Maintenance and operations requirements.

(a) The owner of the facility must establish an adequate maintenance system and provide qualified maintenance personnel to maintain the facility at the level attained at the time it was commissioned. Each person who maintains a facility must meet

tive maintenance, and emergency maintenance, including instructions on each of the following:

(1) Physical security of the facility.

(2) Maintenance and operations by authorized persons only.

(3) FCC licensing requirements for operating and maintenance personnel.

(4) Posting of licenses and signs.

(5) Relations between the facility and FAA air traffic control facilities, with a description of the boundaries of controlled airspace over or near the facility, instructions for relaying air traffic control instructions and information (if applicable), and instructions for the operation of an air traffic advisory service if the facility is located outside of controlled airspace.

(6) Notice to the Administrator of any suspension of service.

(7) Detailed arrangements for maintenance flight inspection and servicing stating the frequency of servicing.

(8) Air-ground communications, if provided, expressly written or incorporating appropriate sections of FAA manuals by reference.

(9) Keeping of station logs and other technical reports, and the submission of reports required by § 171.33.

(10) Monitoring of the facility, at least once each half hour, to assure continuous operation.

(11) Inspections by United States personnel.

(12) Names, addresses, and telephone numbers of persons to be notified in an emergency.

(13) Shutdowns for routine maintenance and issue of ''Notices to Airmen'' for routine or emergency shutdowns (private use facilities may omit the ''Notices to Airmen'').

(14) Commissioning of the facility.

(15) An acceptable procedure for amending or revising the manual.

(16) The following information concerning the facility:

(i) Location by latitude and longitude to the nearest second, and its position with respect to airport layouts.

(c) If the owner desires to modify the facility, he must submit the proposal to the FAA and meet applicable requirements of the FCC.

(d) The owner's maintenance personnel must participate in initial inspections made by the FAA. In the case of subsequent inspections, the owner or his representative shall participate.

(e) The owner shall provide a stock of spare parts, including vacuum tubes, of such a quantity to make possible the prompt replacement of components that fail or deteriorate in service.

(f) The owner shall close the facility upon receiving two successive pilot reports of its malfunctioning.

(Amdt. 171–2, Eff. 5/30/66)

§ 171.33 Reports.

The owner of each facility to which this subpart applies shall make the following reports, at the times indicated, to the FAA Regional office for the area in which the facility is located:

(a) *Record of meter readings and adjustments (Form FAA–198).* To be filled out by the owner or his maintenance representative with the equipment adjustments and meter readings as of the time of commissioning, with one copy to be kept in the permanent rec- ords of the facility and two copies to the appropriate Regional Office of the FAA. The owner shall revise the form after any major repair, modernization, or returning, to reflect an accurate record of facility operation and adjustment.

(b) *Facility maintenance log (FAA Form 6030–1).* This form is a permanent record of all equipment malfunctioning met in maintaining the facility, including information on the kind of work and adjustments made, equipment failures, causes (if determined), and corrective action taken. The owner shall keep the original of each report at the facility and send a copy to the appropriate Regional Office of the FAA at the end of the month in which it is prepared.

(c) *Radio equipment operation record (Form FAA–418).* To contain a complete record of meter

Instrument Landing System (ILS) Facilities that are to be involved in the approval of instrument flight rules and air traffic control procedures related to those facilities.

(Amdt. 171–2, Eff. 5/30/66); (Amdt. 171–7, Eff. 9/9/70)

§ 171.43 Requests for IFR procedure.

(a) Each person who requests an IFR procedure based on an ILS facility that he owns must submit the following information with that request:

(1) A description of the facility and evidence that the equipment meets the performance requirements of § 171.47 and is installed in accordance with § 171.49.

(2) A proposed procedure for operating the facility.

(3) A proposed maintenance organization and a maintenance manual that meets the requirements of § 171.51.

(4) A statement of intent to meet the requirements of this subpart.

(5) A showing that the facility has an acceptable level of operational reliability and an acceptable standard of performance. Previous equivalent operational experience with a facility with identical design and operational characteristics will be considered in showing compliance with this subparagraph.

(b) After the FAA inspects and evaluates the facility, it advises the owner of the results and of any required changes in the facility or the maintenance manual or maintenance organization. The owner must then correct the deficiencies, if any, and operate the facility for an in-service evaluation by the FAA.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.45 Minimum requirements for approval.

(a) The following are the minimum requirements that must be met before the FAA will approve by air and ground inspection, must meet the requirements of § 171.47.

(2) The installation of the equipment must meet the requirements of § 171.49.

(3) The owner must agree to operate and maintain the facility in accord- ance with § 171.51.

(4) The owner must agree to furnish periodic reports, as set forth in § 171.53 and agree to allow the FAA to inspect the facility and its operation whenever necessary.

(5) The owner must assure the FAA that he will not withdraw the facility from service without the permission of the FAA.

(6) The owner must bear all costs of meeting the requirements of this section and of any flight or ground inspections made before the facility is commissioned, except that the Federal Aviation Administration may bear certain of these costs subject to budgetary limitations and policy established by the Administrator.

(b) If the applicant for approval meets the requirements of paragraph (a) of this section, the FAA commissions the facility as a prerequisite to its approval for use in an IFR procedure. The approval is withdrawn at any time the facility does not continue to meet those requirements. In addition, the facility may be de-commissioned whenever the frequency channel is needed for higher priority common system service.

(Amdt. 171–6, Eff. 7/24/70)

§ 171.47 Performance requirements.

(a) The Instrument Landing System must perform in accordance with the "International Standards and Recommended Practices, Aeronautical Telecommunications, Part I, Paragraph 3.1" (Annex 10 to the Convention on International Civil Aviation) except as follows:

(1) The first part of paragraph 3.1.3, relating to suppression of radiation wholly or in part in any or all directions outside the 20-degree sector

the area to the rear of the localizer may be made unusable and should be so advertised.

(3) A third marker beacon (inner marker) is not required.

(4) The frequency tolerance of the radio frequency carrier must not exceed plus or minus 0.002 percent.

(b) Ground inspection consists of an examination of the design features of the equipment to determine that there will not be conditions that will allow unsafe operations because of component failure or deterioration.

(c) The monitor is checked periodically, during the in-service test evaluation period, for calibration and stability. These tests, and ground checks of glide slope and localizer radiation characteristics, are conducted in accordance with FAA Handbooks AF P 6750.1 and AF P 6750.2 "Maintenance Instructions for ILS Localizer Equipment" and "Maintenance Instructions for ILS Glide Slope Equipment".

(d) Flight tests to determine the facility's adequacy for operational requirements and compliance with applicable "Standards and Recommended Practices" are conducted in accordance with the "U.S. Standard Flight Inspection Manual", particularly section 217.

(Amdt. 171–9, Eff. 11/19/73)

§ 171.49 Installation requirements.

(a) The facility must be of a permanent nature, located, constructed, and installed according to ICAO Standards (Annex 10), accepted good engineering practices, applicable electric and safety codes, and FCC licensing requirements.

(b) The facility must have a reliable source of suitable primary power, either from a power distribution system or locally generated. A determination by the Administrator as to whether a facility will be required to have stand-by power for the localizer, glide slope and monitor accessories to supplement the primary power, will be made for each airport based upon operational minimums and density of air traffic.

(e) The facility must have, or be supplemented by (depending on the circumstances) the following ground-air or landline communications services:

(1) At facilities outside of and not immediately adjacent to air traffic control zones or areas, there must be ground-air communications from the airport served by the facility. The utilization of voice on the ILS frequency should be determined by the facility operator on an individual basis.

(2) At facilities within or immediately adjacent to air traffic control zones or areas, there must be the ground-air communications required by paragraph (e)(1) of this section and reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communication facility.

Paragraphs (e) (1) and (2) of this section are not mandatory at airports where an adjacent FAA facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to air traffic control zones or areas, and where extensive delays are not a factor, the requirements of paragraphs (e) (1) and (2) of this section may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communications facility, if an adjacent FAA facility can communicate with aircraft during the proposed instrument approach procedure down to the airport surface or at least to the minimum approach altitude.

[(e) The facility must have, or be supplemented by (depending on the circumstances) the following ground-air or landline communications services:

[(1) At facilities outside of and not immediately adjacent to controlled airspace, there must be ground-air communications from the airport served by the facility. The utilization of voice on the ILS frequency should be determined by the facility operator on an individual basis.

[(2) At facilities within or immediately adjacent to controlled airspace, there must be the ground-air communications required by para-

at low traffic density airports within or immediately adjacent to controlled airspace, and where extensive delays are not a factor, the requirements of paragraphs (e)(1) and (e)(2) of this section may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communications facility, if an adjacent FAA facility can communicate with aircraft during the proposed instrument approach procedure down to the airport surface or at least to the minimum approach altitude.]

(Amdt. 171–6, Eff. 7/24/70); [(Amdt. 171–16, Eff. 9/16/93)]

§ 171.51 Maintenance and operations requirements.

(a) The owner of the facility must establish an adequate maintenance system and provide qualified maintenance personnel to maintain the facility at the level attained at the time it was commissioned. Each person who maintains a facility must meet at least the Federal Communications Commission's licensing requirements and show that he has the special knowledge and skills needed to maintain the facility including proficiency in maintenance procedures and the use of specialized test equipment.

(b) The owner must prepare, and obtain approval of, an operations and maintenance manual that sets forth mandatory procedures for operations, preventive maintenance, and emergency maintenance, including instructions on each of the following:

(1) Physical security of the facility.

(2) Maintenance and operations by authorized persons only.

(3) FCC licensing requirements for operating and maintenance personnel.

(4) Posting of licenses and signs.

(5) Relation between the facility and FAA air traffic control facilities, with a description of the boundaries of controlled airspace over or near the facility, instructions for relaying air traffic control instructions and information (if expressly written or incorporating appropriate sections of FAA manuals by reference.

(9) Keeping of station logs and other technical reports, and the submission of reports required by § 171.53.

(10) Monitoring of the facility.

(11) Inspections by United States personnel.

(12) Names, addresses, and telephone numbers of persons to be notified in an emergency.

(13) Shutdowns for routine maintenance and issue of ''Notices to Airmen'' for routine or emergency shutdowns (private use facilities may omit the ''Notices to Airmen'').

(14) Commissioning of the facility.

(15) An acceptable procedure for amending or revising the manual.

(16) An explanation of the kinds of activities (such as construction or grading) in the vicinity of the facility that may require shutdown or recertification of the facility by FAA flight check.

(17) Procedures for conducting a ground check or localizer course alignment width, and clearance, and glide slope elevation angle and width.

(18) The following information concerning the facility:

(i) Facility component locations with respect to airport layout, instrument runway, and similar areas.

(ii) The type, make, and model of the basic radio equipment that will provide the service.

(iii) The station power emission and frequencies of the localizer, glide slope, markers, and associated compass locators, if any.

(iv) The hours of operation.

(v) Station identification call letters and method of station identification and the time spacing of the identification.

(vi) A description of the critical parts that may not be changed, adjusted, or repaired without an FAA flight check to confirm published operations.

(c) The owner shall make a ground check of the facility each month in accordance with procedures approved by the FAA at the time of commis-

or his representative shall participate."

(f) Whenever it is required by the FAA, the owner shall incorporate improvements in ILS maintenance brought about by progress in the state of the art. In addition, he shall provide a stock of spare parts, including vacuum tubes, of such a quantity to make possible the prompt replacement of components that fail or deteriorate in service.

(g) The owner shall provide FAA approved test instruments needed for maintenance of the facility.

(h) The owner shall close the facility upon receiving two successive pilot reports of its malfunctioning.

(Amdt. 171–2, Eff. 5/30/66)

§ 171.53 Reports.

The owner of each facility to which this subpart applies shall make the following reports, at the times indicated, to the FAA Regional Office for the area in which the facility is located:

accurate record of facility operation and adjustment.

(b) *Facility maintenance log* (*Form FAA 6030–1*). This form is a permanent record of all equipment malfunctioning met in maintaining the facility, including information on the kind of work and adjustments made, equipment failures, causes (if determined), and corrective action taken. The owner shall keep the original of each report at the facility and send a copy to the appropriate Regional Office of the FAA at the end of each month in which it is prepared.

(c) *Radio equipment operation record* (*Form FAA–418*). To contain a complete record of meter readings, recorded on each scheduled visit to the facility. The owner shall keep the original of each month's record at the facility and send a copy of it to the appropriate Regional Office of the FAA.

(Amdt. 171–5, Eff. 9/30/69); (Amdt. 171–10, Eff. 8/19/75)

(a) Except as provided in paragraph (b) of this section, each air navigation certificate of "Lawful Authority to Operate a True Light" is hereby revoked, and each application therefore is hereby terminated.

(b) Paragraph (a) of this section does not apply to—

(1) A certificate issued to a Federal-Aid Airport Program sponsor who was required to apply

(2) An application made by a Federal-Aid Airport Program sponsor who was required to make that application under regulations then in effect, and who has not terminated that application under § 151.86(e) of this chapter.

(49 U.S.C. 1101–1120; sec. 307, 72 Stat. 749, 49 U.S.C. 1348)

(Amdt. 171–4, Eff. 9/5/68)

documents incorporated by reference in this part are available for the use of interested persons at any FAA Regional Office and FAA Headquarters. An historical file of these materials is maintained at Headquarters, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20590.

(Amdt. 171–8, Eff. 4/24/71)

§ 171.73 Alternative forms of reports.

On a case-by-case basis, a Regional Administrator may accept any report in a format other than the FAA form required by this part if he is satisfied that the report contains all the information required on the FAA form and can be processed by FAA as conveniently as the FAA form.

(49 U.S.C. 1348)

(Amdt. 171–3, Eff. 5/17/68); (Amdt. 171–5, Eff. 9/30/69); (Amdt. 171–15, Eff. 10/25/89)

design and operational characteristics identical to those of facilities currently approved under this part, including requests for deviations from this part for such facilities, must be submitted to the Director, Advanced Systems Design Service.

(b) The following requests must be submitted to the Regional Administrator of the region in which the facility is located:

(1) Requests for approval of facilities that have design and operational characteristics identical to those of facilities currently approved under this part, including requests for deviations from this part for such facilities.

(2) Requests for deviations from this part for facilities currently approved under this part.

(3) Requests for modification of facilities currently approved under this part.

(Amdt. 171–7, Eff. 9/9/70); (Amdt. 171–15, Eff. 10/25/89)

§ 171.101 Scope.

This subpart sets forth minimum requirements for the approval and operation of non-Federal Simplified Directional Facilities (SDF) that are to be involved in the approval of instrument flight rules and air traffic control procedures related to those facilities.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.103 Requests for IFR procedure.

(a) Each person who requests an IFR procedure based on an SDF that he owns must submit the following information with that request:

(1) A description of the facility and evidence that the equipment meets the performance requirements of § 171.109 and the standards and tolerances of § 171.111, and is installed in accordance with § 171.113.

(2) A proposed procedure for operating the facility.

(3) A proposed maintenance organization and a maintenance manual that meets the requirements of § 171.115.

(4) A statement of intent to meet the requirements of this subpart.

(5) A showing that the facility has an acceptable level of operational reliability as prescribed in § 171.111(k), and an acceptable standard of performance. Previous equivalent operational experience with a facility with identical design and operational characteristics will be considered in showing compliance with this paragraph.

(b) After the Federal Aviation Administration inspects and evaluates the facility, it advises the owner of the results and of any required changes in the facility or the maintenance manual or maintenance organization. The owner must then correct the deficiencies, if any, and operate the facility for an in-service evaluation by the Federal Aviation Administration.

(Amdt. 171–7, Eff. 9/9/70)

Administration will approve an IFR procedure for a non-Federal Simplified Directional Facility:

(1) A suitable frequency channel must be available.

(2) The facility's performance, as determined by air and ground inspection, must meet the requirements of §§ 171.109 and 171.111.

(3) The installation of the equipment must meet the requirements of § 171.113.

(4) The owner must agree to operate and maintain the facility in accordance with § 171.115.

(5) The owner must agree to furnish periodic reports as set forth in § 171.117, and agree to allow the FAA to inspect the facility and its operation whenever necessary.

(6) The owner must assure the FAA that he will not withdraw the facility from service without the permission of the FAA.

(7) The owner must bear all costs of meeting the requirements of this section and of any flight or ground inspections made before the facility is commissioned, except that the FAA may bear certain of these costs subject to budgetary limitations and policy established by the Administrator.

(b) If the applicant for approval meets the requirements of paragraph (a) of this section, the FAA commissions the facility as a prerequisite to its approval for use in an IFR procedure. The approval is withdrawn at any time the facility does not continue to meet those requirements. In addition, the facility is licensed by the Federal Communications Commission. The Federal Aviation Administration recommends cancellation or nonrenewal of the Federal Communications Commission license whenever the frequency channel is needed for higher priority common system service.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.107 Definition.

As used in this subpart:

"SDF" (simplified directional facility) means a directional aid facility providing only lateral guid-

"Back course sector" means the course sector on the opposite end of the runway from the front course sector.

"Course line" means the locus of points along the final approach course at which the DDM is zero.

"Course sector" means a sector in a horizontal plane containing the course line and limited by the loci of points nearest to the course line at which the DDM is 0.155.

"Displacement sensitivity" means the ratio of measured DDM to the corresponding lateral displacement from the appropriate reference line.

"Front course sector" means the course sector centered on the course line in the direction from the runway in which a normal final approach is made.

"Half course sector" means the sector in a horizontal plane containing the course line and limited by the loci of points nearest to the course line, at which the DDM is 0.0775.

"Point A" means a point on the front course in the approach direction a distance of 4 nautical miles from the threshold.

"Point A1" means a point on the front course in the approach direction a distance of 1 statute mile from the threshold.

"Point A2" means a point on the front course at the threshold.

"Reference datum" means a point at a specified height located vertically above the intersection of the course and the threshold.

"Missed approach point" means the point on the final approach course, not farther from the final approach fix than Point "A2", at which the approach must be abandoned, if the approach and subsequent landing cannot be safely completed by visual reference, whether or not the aircraft has descended to the minimum descent altitude.

(Amdt. 171–7, Eff. 9/9/70)

a course sector with the 90 Hz tone predominating on one side of the course and with the 150 Hz tone predominating on the opposite side.

(2) When an observer faces the SDF from the approach end of runway, the depth of modulation of the radio frequency carrier due to the 150 Hz tone must predominate on his right hand and that due to the 90 Hz tone must predominate on his left hand.

(3) All horizontal angles employed in specifying the SDF field patterns must originate from the center of the antenna system which provides the signals used in the front course sector.

(4) The SDF must operate on odd tenths or odd tenths plus a twentieth MHz within the frequency band 108.1 MHz to 111.95 MHz. The frequency tolerance of the radio frequency carrier must not exceed plus or minus 0.002 percent.

(5) The radiated emission from the SDF must be horizontally polarized. The vertically polarized component of the radiation on the course line must not exceed that which corresponds to an error one-twentieth of the course sector width when an aircraft is positioned on the course line and is in a roll attitude of 20° from the horizontal.

(6) The SDF must provide signals sufficient to allow satisfactory operation of a typical aircraft installation within the sector which extends from the center of the SDF antenna system to distances of 18 nautical miles within a plus or minus 10° sector and 10 nautical miles within the remainder of the coverage when alternative navigational facilities provide satisfactory coverage within the intermediate approach area. SDF signals must be receivable at the distances specified at and above a height of 1,000 feet above the elevation of the threshold, or the lowest altitude authorized for transition, whichever is higher. Such signals must be receivable, to the distances specified, up to a surface extending outward from the SDF antenna and inclined at 7° above the horizontal.

approach course and the extended runway centerline must not exceed 30°. The final approach course must be aligned to intersect the extended runway centerline between points A1 and the runway threshold. When an operational advantage can be achieved, a final approach course that does not intersect the runway or that intersects it at a distance greater than point A1 from the threshold, may be established, if that course lies within 500 feet laterally of the extended runway centerline at a point 3,000 feet outward from the runway threshold. The mean course line must be maintained within ±10 percent of the course sector width.

(9) The nominal displacement sensitivity within the half course sector must be 50 microamperes/degree. The nominal course sector width must be 6°. When an operational advantage can be achieved, a nominal displacement sensitivity of 25 microamperes/degree may be established, with a nominal course sector width of 12° with proportional displacement sensitivity. The lateral displacement sensitivity must be adjusted and maintained within the limits of plus or minus 17 percent of the nominal value.

(10) The off-course (clearance) signal must increase at a substantially linear rate with respect to the angular displacement from the course line up to an angle on either side of the course line where 175 microamperes of deflection is obtained. From that angle to ±10° the off-course deflection must not be less than 175 microamperes. From ±10° to ±35° the off-course deflection must not be less than 150 microamperes. With the course adjusted to cause any of several monitor alarm conditions, the aforementioned values of 175 microamperes in the sector 10° each side of course and 150 microamperes in the sector ±10° to ±35° may be reduced to 160 microamperes and 135 microamperes, respectively. These conditions must be met at a distance of 18 nautical miles from the SDF antenna within the sector 10° each side of course line and 10 nautical miles from the SDF antenna within the sector ±10° to ±35° each side of course line.

zontally polarized. Where two carriers are modulated with speech, the relative phases of the modulations on the two carriers must avoid the occurence of nulls within the coverage of the SDF.

(ii) On centerline, the peak modulation depth of the carrier or carriers due to the radiotelephone communications must not exceed 50 percent but must be adjusted so that the ratio of peak modulation depth due to the radiotelephone communications to that due to the identification signal is approximately 9:1.

(iii) The audiofrequency characteristics of the radiotelephone channel must be flat to within 3 db relative to the level at 1,000 Hz over the range from 300 Hz to 3,000 Hz.

(12)(i) The SDF must provide for the simultaneous transmission of an identification signal, specific to the runway and approach direction, on the same radiofrequency carrier or carriers as used for the SDF function. The transmission of the identification signal must not interfere in any way with the basic SDF function.

(ii) The identification signal must be produced by Class A2 modulation of the radiofrequency carrier or carriers using a modulation tone of 1020 Hz within ±50 Hz. The depth of modulation must be between the limits of 5 and 15 percent except that, where a radiotelephone communication channel is provided, the depth of modulation must be adjusted so that the ratio of peak modulation depth due to radiotelephone communications to that due to the identification signal modulation is approximately 9:1. The emissions carrying the identification signal must be horizontally polarized.

(iii) The identification signal must employ the International Morse Code and consist of three letters.

(iv) The identification signal must be transmitted at a speed corresponding to approximately seven words per minute, and must be repeated at approximately equal intervals, not less than six times per minute. When SDF transmission is not available for oper-

(c) The monitor must be checked periodically during the in-service test evaluation period for calibration and stability. These tests, and ground checks of SDF radiation characteristics must be conducted in accordance with the maintenance manual required by § 171.115(c) and must meet the standards and tolerances contained in § 171.111(j).

(d) The monitor system must provide a warning to the designated control point(s) when any of the conditions of § 171.111(j) occur, within the time periods specified in that paragraph.

(e) Flight inspection to determine the adequacy of the facility's operational performance and compliance with applicable performance requirements must be conducted in accordance with the "U.S. Standard Flight Inspection Manual." Tolerances contained in the U.S. Standard Flight Inspection Manual, section 217, must be complied with except as stated in paragraph (f) of this section.

(f) Flight inspection tolerances specified in section 217 of the "U.S. Standard Flight Inspection Manual" must be complied with except as follows:

(1) *Course sector width.* The nominal course sector width must be 6°. When an operational advantage can be achieved, a nominal course sector width of 12° may be established. Course sector width must be adjusted and maintained within the limits of ±17 percent of the nominal value.

(2) *Course alignment.* The mean course line must be adjusted and maintained within the limits of ±10 percent of the nominal course sector width.

(3) *Course structure.* Course deviations due to roughness, scalloping, or bends must be within the following limitations:

(i) *Front course.* (*a*) Course structure from 18 miles from runway threshold to Point A must not exceed ±40 microamperes;

(*b*) Point A to Point A–1—linear decrease from not more than ±40 microamperes at Point A to not more than ±20 microamperes at Point A–1;

(*c*) Point A–1 to Missed Approach Point—not more than ±20 microamperes;

a linear rate.

(*b*) Monitor tolerances: width—±17 percent of nominal; alignment—±10 percent of nominal course sector width.

(Amdt. 171–7, Eff. 9/9/70); (Amdt. 171–9, Eff. 11/19/73)

§ 171.111 Ground standards and tolerances.

Compliance with this section must be shown as a condition to approval and must be maintained during operation of the SDF.

(a) *Frequency.* (1) The SDF must operate on odd tenths or odd tenths plus a twentieth MHz within the frequency band 108.1 MHz to 111.95 MHz. The frequency tolerance of the radio frequency carrier must not exceed plus or minus 0.002 percent.

(2) The modulating tones must be 90 Hz and 150 Hz within ±2.5 percent.

(3) The identification signal must be 1020 Hz within ±50 Hz.

(4) The total harmonic content of the 90 Hz tone must not exceed 10 percent.

(5) The total harmonic content of the 150 Hz tone must not exceed 10 percent.

(b) *Power output.* The normal carrier power output must be of a value which will provide coverage requirements of § 171.109(a)(6) when reduced by 3 dB to the monitor RF power reduction alarm point specified in § 171.111(j)(3).

(c) *VSWR.* (1) The VSWR of carrier and sideband feedlines must be a nominal value of 1/1 and must not exceed 1.2/1.

(2) The sponsor will also provide additional manufacturer's ground standards and tolerances for all VSWR parameters peculiar to the equipment which can effect performance of the facility in meeting the requirements specified in §§ 171.109 and 171.111.

(d) *Insulation resistance.* The insulation resistance of all coaxial feedlines must be greater than 20 megohms.

(e) *Depth of modulation.* (1) The depth of modulation of the radio frequency carrier due to each

ard.

(g) *Course alignment.* Course alignment must be as specified in § 171.109(a)(8).

(h) *Back course alignment and width.* If a back course is provided, standards and tolerances for back course sector width and alignment must be the same as course sector width and course alignment specified in paragraphs (f) and (g) of this section.

(i) *Clearance.* Clearance must be as specified in § 171.109(a)(10).

(j) *Monitor standards and tolerances.* (1) The monitor system must provide a warning to the designated control point(s) when any of the conditions described in this paragraph occur, within the time periods specified in paragraph (j)(6) of this section.

(2) Course shift alarm: The monitor must alarm and cause radiation to cease, or identification and navigation signals must be removed, if the course alignment deviates from standard alignment by 10 percent or more of the standard course sector width.

(3) RF power reduction alarm: The monitor must alarm and cause radiation to cease, or identification and navigation signals must be removed, if the output power is reduced by 3 db or more from normal.

(4) Modulation level alarm: The monitor must alarm and cause radiation to cease, or identification and navigation signals must be removed, if the 90 Hz and 150 Hz modulation levels decrease by 17 percent or more.

(5) Course sector width alarm: The monitor must alarm and cause radiation to cease, or identification and navigation signals must be removed, for a change in course sector width to a value differing by ±17 percent or more from the standard.

(6) Monitor delay before shutdown: Radiation must cease, or identification and navigation signals must be removed, within 10 seconds after a fault is detected by the monitor, and no attempt must be made to resume radiation for a period of at least 20 seconds. If an automatic recycle device is used, not more than three successive

(l) *Course alignment stability.* Drift of the course alignment must not exceed one-half the monitor limit in a 1-week period.

(Amdt. 171–7, Eff. 9/9/70); (Amdt. 171–9, Eff. 11/19/73)

§ 171.113 Installation requirements.

(a) The facility must be installed according to accepted good engineering practices, applicable electric and safety codes, and FCC requirements.

(b) The SDF facility must have the following basic components:

(1) VHF SDF equipment and associated monitor system;

(2) Remote control, and indicator equipment (remote monitor) when required by the FAA;

(3) A final approach fix; and

(4) Compass locator (COMLO) or marker if suitable fixes and initial approach routes are not available from existing facilities.

(c) The facility must have a reliable source of suitable primary power, either from a power distribution system or locally generated. Also, adequate power capacity must be provided for operation of test and working equipment at the SDF. A determination by the Federal Aviation Administration as to whether a facility will be required to have standby power for the SDF and monitor accessories to supplement the primary power will be made for each airport based upon operational minimums and density of air traffic.

(d) A determination by the Federal Aviation Administration as to whether a facility will be required to have dual transmitting equipment with automatic changeover for the SDF will be made for each airport based upon operational minimums and density of air traffic.

(e) There must be a means for determining, from the ground, the performance of the equipment (including antennae), initially and periodically.

(f) The facility must have the following ground/air or landline communication services:

(1) At facilities outside of and not immediately adjacent to air traffic control zones or areas, there

the airport to the nearest Federal Aviation Administration air traffic control or communications facility.

Compliance with paragraphs (f) (1) and (2) of this section need not be shown at airports where an adjacent Federal Aviation Administration facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to air traffic control zones or areas, and where extensive delays are not a factor, the requirements of paragraphs (f) (1) and (2) of this section may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communication facility, if an adjacent Federal Aviation Administration facility can communicate with aircraft during the proposed instrument approach procedure down to the airport surface or at least to the minimum approach altitude.

[(f) The facility must have the following ground-air or landline communication services:

[(1) At facilities outside of and not immediately adjacent to controlled airspace, there must be ground-air communications from the airport served by the facility. The utilization of voice on the SDF should be determined by the facility operator on an individual basis.

[(2) At facilities within or immediately adjacent to controlled airspace, there must be the ground-air communications required by paragraph (b)(1) of this section and reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communications facility.

[Compliance with paragraphs (f)(1) and (2) of this section need not be shown at airports where an adjacent Federal Aviation Administration facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to contolled airspace, and where extensive or at least to the minimum approach altitude.]

(g) At those locations where two separate SDF facilities serve opposite ends of a single runway, an interlock must insure that only the facility serving the approach direction in use can radiate, except where no operationally harmful interference results.

(h) At those locations where, in order to alleviate frequency congestion, the SDF facilities serving opposite ends of one runway employ identical frequencies, an interlock must insure that the facility not in operational use cannot radiate.

(i) Provisions for maintenance and operations by authorized persons only.

(j) Where an operational advantage exists, the installation may omit a back course.

(Amdt. 171–7, Eff. 9/9/70); [(Amdt. 171–16, Eff. 9/16/93)]

§ 171.115 Maintenance and operations requirements.

(a) The owner of the facility shall establish an adequate maintenance system and provide qualified maintenance personnel to maintain the facility at the level attained at the time it was commissioned. Each person who maintains a facility shall meet at a minimum the Federal Communications Commission's licensing requirements and show that he has the special knowledge and skills needed to maintain the facility, including proficiency in maintenance procedures and the use of specialized test equipment.

(b) The SDF must be designed and maintained so that the probability of operation within the performance requirements specified is high enough to insure an adequate level of safety. In the event out-of-tolerance conditions develop, the facility shall be removed from operation, and the designated control point notified.

(c) The owner must prepare, and obtain approval of, and each person operating or maintaining the facility shall comply with, an operations and maintenance manual that sets forth procedures for operations, preventive maintenance, and emergency maintenance, including instructions on each of the following:

requirements for operating personnel and maintenance personnel.

(4) Posting of licenses and signs.

(5) Relation between the facility and Federal Aviation Administration air traffic control facilities, with a description of the boundaries of controlled airspace over or near the facility, instructions for relaying air traffic control instructions and information (if applicable), and instructions for the operation of an air traffic advisory service if the facility is located outside of controlled airspace.

(6) Notice to the Administrator of any suspension of service.

(7) Detailed and specific maintenance procedures and servicing guides stating the frequency of servicing.

(8) Air-ground communications, if provided, expressly written or incorporating appropriate sections of Federal Aviation Administration manuals by reference.

(9) Keeping of station logs and other technical reports, and the submission of reports required by § 171.117.

(10) Monitoring of the facility.

(11) Names, addresses, and telephone numbers of persons to be notified in an emergency.

(12) Inspection by U.S. personnel.

(13) Shutdowns for routine maintenance and issue of "Notices to Airmen" for routine or emergency shutdowns, except that private use facilities may omit "Notices to Airmen."

(14) Commissioning of the facility.

(15) An acceptable procedure for amending or revising the manual.

(16) An explanation of the kinds of activities (such as construction or grading) in the vicinity of the facility that may require shutdown or certification of the facility by Federal Aviation Administration flight check.

(17) Procedure for conducting a ground check of SDF course alignment, width and clearance.

(18) The following information concerning the facility:

(v) Station identification call letters and method of station identification and the time spacing of the identification;

(vi) A description of the critical parts that may not be changed, adjusted, or repaired without a Federal Aviation Administration flight check to confirm published operations.

(d) The owner shall make a ground check of the facility each month in accordance with procedures approved by the Federal Aviation Administration at the time of commissioning, and shall report the results of the checks as provided in § 171.117.

(e) If the owner desires to modify the facility, he shall submit the proposal to the Federal Aviation Administration and may not allow any modifications to be made without specific approval.

(f) The owner's maintenance personnel shall participate in initial inspections made by the Federal Aviation Administration. In the case of subsequent inspections, the owner or his representatives shall participate.

(g) Whenever it is required by the Federal Aviation Administration, the owner shall incorporate improvements in SDF maintenance. In addition, he shall provide a stock of spare parts, of such a quantity, to make possible the prompt replacement of components that fail or deteriorate in service.

(h) The owner shall provide Federal Aviation Administration approved test instruments needed for maintenance of the facility.

(i) The owner shall close the facility by ceasing radiation and shall issue a "Notice to Airmen" that the facility is out of service (except that private use facilities may omit "Notices to Airmen"), upon receiving two successive pilot reports of its malfunctioning.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.117 Reports.

The owner of each facility tve mich this subpart applies shall make the following reports, at the time indicated, to the Federal Aviation Administration Regional Office for the area in which the facility is located:

retuning, to reflect an accurate record of facility operation and adjustment.

(b) Facility maintenance log (FAA Form 6030–1) This form is a permanent record of all equipment malfunctioning met in maintaining the facility, including information on the kind of work and facility. The owner shall keep the original of each month's record at the facility and send a copy of it to the appropriate Regional Office of the Federal Aviation Administration.

(Amdt. 171–7, Eff. 9/9/70); (Amdt. 171–10, Eff. 8/19/75)

§ 171.151 Scope.

This subpart sets forth minimum requirements for the approval and operation of non-Federal DME facilities that are to be involved in the approval of instrument flight rules and air traffic control procedures related to those facilities.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.153 Requests for IFR procedure.

(a) Each person who requests an IFR procedure based on a DME facility that he owns must submit the following information with that request:

(1) A description of the facility and evidence that the equipment meets the performance requirements of § 171.157 and is installed in accordance with § 171.159.

(2) A proposed procedure for operating the facility.

(3) A proposed maintenance organization and maintenance manual that meets the requirement of § 171.161.

(4) A statement of intention to meet the requirements of this subpart.

(5) A showing that the facility has an acceptable level of operational reliability and an acceptable standard of performance. Previous equivalent operational experience with a facility with identical design and operational characteristics will be considered in showing compliance with this paragraph.

(b) After the Federal Aviation Administration inspects and evaluates the facility, it advises the owner of the results and of any required changes in the facility or the maintenance manual or maintenance organization. The owner must then correct the deficiencies, if any, and operate the facility for an in-service evaluation by the Federal Aviation Administration.

(Amdt. 171–7, Eff. 9/9/70)

Administration will approve an IFR procedure for a non-Federal DME:

(1) A suitable frequency channel must be available.

(2) The facility's performance, as determined by air and ground inspection, must meet the requirements of § 171.157.

(3) The installation of the equipment must meet the requirements of § 171.159.

(4) The owner must agree to operate and maintain the facility in accordance with § 171.161.

(5) The owner must agree to furnish periodic reports, as set forth in § 171.163, and must agree to allow the Federal Aviation Administration to inspect the facility and its operation whenever necessary.

(6) The owner must assure the Federal Aviation Administration that he will not withdraw the facility from service without the permission of the Federal Aviation Administration.

(7) The owner must bear all costs of meeting the requirements of this section and of any flight or ground inspections made before the facility is commissioned, except that the Federal Aviation Administration may bear certain of these costs subject to budgetary limitations and policy established by the Administrator.

(b) If the applicant for approval meets the requirements of paragraph (a) of this section, the Federal Aviation Administration commissions the facility as a prerequisite to its approval for use in an IFR procedure. The approval is withdrawn at any time the facility does not continue to meet those requirements.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.157 Performance requirements.

(a) The DME must meet the performance requirements set forth in the "International Standards and Recommended Practices. Aeronautical Telecommunications, Part I, Paragraph 3.5" (Annex 10 to the Convention of International Civil Aviation).

tics of the DME transponder must be conducted in accordance with the maintenance manual required by § 171.161(b).

(d) Flight inspection to determine the adequacy of the facility's operational performance and compliance with applicable "Standards and Recommended Practices" must be accomplished in accordance with the "U.S. Standard Flight Inspection Manual."

(Amdt. 171–7, Eff. 9/9/70); (Amdt. 171–13, Eff. 11/27/85)

§ 171.159 Installation requirements.

(a) The facility must be installed according to accepted good engineering practices, applicable electric and safety codes, and Federal Communications Commission requirements.

(b) The facility must have a reliable source of suitable primary power, either from a power distribution system or locally generated, with a supplemental standby system, if needed.

(c) Dual transmitting equipment with automatic changeover is preferred and may be required to support certain IFR procedures.

(d) There must be a means for determining from the ground, the performance of the equipment, initially and periodically.

(e) A facility intended for use as an instrument approach aid for an airport must have or be supplemented by the following ground air or landline communications services:

(1) At facilities outside of and not immediately adjacent to air traffic control areas, there must be ground-air communications from the airport served by the facility. Separate communications channels are acceptable.

(2) At facilities within or immediately adjacent to air traffic control areas, there must be the ground-air communications required by paragraph (e)(1) of this section and reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communication facility. Separate communications channels are acceptable.

of paragraphs (e) (1) and (2) of this section may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communications facility, if an adjacent Federal Aviation Administration facility can communicate with aircraft during the proposed instrument approach procedure, at least down to the minimum en route altitude for the controlled area.

[(1) At facilities outside of and not immediately adjacent to controlled airspace, there must be ground-air communications from the airport served by the facility. Separate communications channels are acceptable.]

[(2) At facilities within or immediately adjacent to controlled airspace, there must be the ground-air communications required by paragraph (e)(1) of this section and reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communications facility. Separate communications channels are acceptable.]

[Compliance with paragraphs (e)(1) and (2) of this section need not be shown at airports where an adjacent Federal Aviation Administration facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to controlled airspace, and where extensive delays are not a factor, the requirements of paragraphs (e)(1) and (2) of this section may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communications facility, if an adjacent Federal Aviation Administration facility can communicate with aircraft during the proposed instrument approach procedure, at least down to the minimum en route altitude for the controlled airspace area.]

(Amdt. 171–7, Eff. 9/9/70); [(Amdt. 171–16, Eff. 9/16/93)]

mission's licensing requirements and show that he has the special knowledge and skills needed to maintain the facility, including proficiency in maintenance procedures and the use of specialized test equipment.

(b) The owner must prepare and obtain Federal Aviation Administration approval of, and each person operating or maintaining the facility shall comply with, an operations and maintenance manual that sets forth procedures for operations, preventive maintenance, and emergency maintenance, including instructions on each of the following:

(1) Physical security of the facility.

(2) Maintenance and operations by authorized persons only.

(3) Federal Communications Commission's requirements and maintenance personnel.

(4) Posting of licenses and signs.

(5) Relations between the facility and Federal Aviation Administration air traffic control facilities, with a description of the boundaries of controlled airspace over or near the facility, instructions for relaying air traffic control instructions and information (if applicable), and instructions for the operation of an air traffic advisory service if the DME is located outside of controlled airspace.

(6) Notice to the Administrator of any suspension of service.

(7) Detailed and specific maintenance procedures and servicing guides stating the frequency of servicing.

(8) Air-ground communications, if provided, expressly written or incorporating appropriate sections of Federal Aviation Administration manuals by reference.

(9) Keeping of station logs and other technical reports, and the submission of reports required by § 171.163.

(10) Monitoring of the facility.

(11) Inspections by U.S. personnel.

(12) Names, addresses, and telephone numbers of persons to be notified in an emergency.

(13) Shutdowns for routine maintenance and issue of "Notices to Airmen" for routine or emergency

(16) An acceptable procedure for amending or revising the manual.

(17) The following information concerning the facility:

(i) Location by latitude and longitude to the nearest second, and its position with respect to airport layouts.

(ii) The type, make, and model of the basic radio equipment that will provide the service.

(iii) The station power emission and frequency.

(iv) The hours of operation.

(v) Station identification call letters and methods of station identification, whether by Morse code or recorded voice announcement, and the time spacing of the identification.

(vi) A description of the critical parts that may not be changed, adjusted, or repaired without an FAA flight check to confirm published operations.

(c) The owner shall make a monthly ground operational check in accordance with procedures approved by the FAA at the time of commissioning, and shall report the results of the checks as provided in § 171.163.

(d) If the owner desires to modify the facility, he shall submit the proposal to the FAA and may not allow any modifications to be made without specific approval.

(e) The owner's maintenance personnel shall participate in initial inspections made by the FAA. In the case of subsequent inspections, the owner or his representative shall participate.

(f) Whenever it is required by the FAA, the owner shall incorporate improvements in DME maintenance.

(g) The owner shall provide a stock of spare parts of such a quantity to make possible the prompt replacement of components that fail or deteriorate in service.

(h) The owner shall provide FAA-approved test instruments needed for maintenance of the facility.

(i) The owner shall shut down the facility (i.e., cease radiation and issue a NOTAM that the facility is out-of-service) upon receiving two successive pilot reports of its malfunctioning.

(a) Record of meter readings and adjustments (Form FAA–198). To be filled out by the owner with the equipment adjustments and meter readings as of the time of commissioning, with one copy to be kept in the permanent records of the facility and two copies to the appropriate Regional office of the FAA. The owner shall revise the form after any major repair, modification, or returning, to reflect an accurate record of facility operation and adjustment.

of the month in which it is prepared.

(c) Radio equipment operation record (Form FAA–418), containing a complete record of meter readings, recorded on each scheduled visit to the facility. The owner shall keep the original of each month's record at the facility and send a copy of it to the appropriate Regional Office of the Federal Aviation Administration.

(Amdt. 171–7, Eff. 9/9/70); (Amdt. 171–10, Eff. 8/19/75)

§ 171.201 Scope.

(a) This subpart sets forth minimum requirements for the approval and operation of non-Federal VHF marker beacon facilities that are to be involved in the approval of instrument flight rules and air traffic control procedures related to those facilities.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.203 Requests for IFR procedure.

(a) Each person who requests an IFR procedure which will incorporate the use of a VHF marker beacon facility that he owns must submit the following information with that request:

(1) A description of the facility and evidence that the equipment meets the performance requirements of § 171.207 and is installed in accordance with § 171.209.

(2) A proposed procedure for operating the facility.

(3) A proposed maintenance organization and a maintenance manual that meets the requirements of § 171.211.

(4) A statement of intent to meet the requirement of this subpart.

(5) A showing that the facility has an acceptable level of operational reliability, and an acceptable standard of performance. Previous equivalent operational experience may be shown to comply with this subparagraph.

(b) After the Federal Aviation Administration inspects and evaluates the facility, it advises the owner of the results and of any required changes in the facility or the maintenance manual or maintenance organization. The owner shall then correct the deficiencies, if any, and operate the facility for an in-service evaluation by the Federal Aviation Administration.

(Amdt. 171–7, Eff. 9/9/70)

that must be met before the Federal Aviation Administration will approve an IFR procedure which incorporates the use of a non-Federal VHF marker beacon facility under this subpart:

(1) The facility's performances, as determined by air and ground inspection, must meet the requirements of § 171.207.

(2) The installation of the equipment must meet the requirements of § 171.209.

(3) The owner must agree to operate and maintain the facility in accordance with § 171.211.

(4) The owner must agree to furnish periodic reports, as set forth in § 171.213, and agree to allow the Federal Aviation Administration to inspect the facility and its operation whenever necessary.

(5) The owner must assure the Federal Aviation Administration that he will not withdraw the facility from service without the permission of the Federal Aviation Administration.

(6) The owner must bear all costs of meeting the requirements of this section and of any flight or ground inspections made before the facility is commissioned, except that the Federal Aviation Administration may bear certain of these costs subject to budgetary limitations and policy established by the Administrator.

(b) If the applicant for approval meets the requirements of paragraph (a) of this section, the Federal Aviation Administration commissions the facility as a prerequisite to its approval for use in an IFR procedure. The approval is withdrawn at any time the facility does not continue to meet those requirements.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.207 Performance requirements.

(a) VHF Marker Beacons must meet the performance requirements set forth in the "International Standards and Recommended Practices, Aeronautical Telecommunications, Part I, paragraphs 3.1.6 and 3.6." (Annex 10 to the Convention on Inter-

These tests and ground tests of the marker radiation characteristics must be conducted in accordance with the maintenance manual required by § 171.211(b).

(c) It must be shown during ground inspection of the design features of the equipment that there will not be conditions that will allow unsafe operations because of component failure or deterioration.

(d) Flight inspection to determine the adequacy of the facility's operational performance and compliance with applicable "Standards and Recommended Practices" are conducted in accordance with the "U.S. Standard Flight Inspection Manual." The original test is made by the Federal Aviation Administration and later tests must be made under arrangements, satisfactory to the Federal Aviation Administration, that are made by the owner.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.209 Installation requirements.

(a) The facility must be installed according to accepted good engineering practices, applicable electric and safety codes, and Federal Communications Commission requirements.

(b) The facility must have a reliable source of suitable primary power.

(c) Dual transmitting equipment may be required, if applicable, to support certain IFR procedures.

(d) At facilities within or immediately adjacent to air traffic control areas, and that are intended for use as instrument approach aids for an airport, there must be ground-air communications or reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communication facility. Compliance with this paragraph need not be shown at airports where an adjacent Federal Aviation Administration facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to air traffic control zones or areas, and where extensive delays are not a factor, the requirements of this paragraph may be ***to controlled airpace and that are intended for use as instrument approach aids for an airport, there must be ground-air communications or reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communication facility. Compliance with this paragraph need not be shown at airports where an adjacent Federal Aviation Administration facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to controlled airpace, and where extensive delays are not a factor, the requirements of this paragraph may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communications facility, if an adjacent Federal Aviation Administration facility can communicate with aircraft during the proposed instrument approach procedure, at least down to the minimum en route altitude for the controlled airspace area.***]

(Amdt. 171–7, Eff. 9/9/70); [(Amdt. 171–16, Eff. 9/16/93)]

§ 171.211 Maintenance and operations requirements.

(a) The owner of the facility shall establish an adequate maintenance system and provide qualified maintenance personnel to maintain the facility at the level attained at the time it was commissioned. Each person who maintains a facility shall meet at a minimum the Federal Communications Commission's licensing requirements and show that he has the special knowledge and skills needed to maintain the facility, including proficiency in maintenance procedures and the use of specialized test equipment.

(b) The owner must prepare, and obtain approval of, and each person who operates or maintains the facility shall comply with, an operations and maintenance manual that sets forth procedures for operations, preventive maintenance, and emergency

(4) Posting of licenses and signs.

(5) Relations between the facility and Federal Aviation Administration air traffic control facilities, with a description of the boundaries of controlled airspace over or near the facility, instructions for relaying air traffic control instructions and information (if applicable).

(6) Notice to the Administrator of any suspension of service.

(7) Detailed arrangements for maintenance, flight inspection, and servicing, stating the frequency of servicing.

(8) Keeping of station logs and other technical reports, and the submission of reports required by § 171.213.

(9) Monitoring of the facility, at least once each half hour, to assure continuous operation.

(10) Inspections by U.S. personnel.

(11) Names, addresses, and telephone numbers of persons to be notified in an emergency.

(12) Shutdowns for routine maintenance and issue of "Notices to Airmen" for routine or emergency shutdowns (private use facilities may omit the "Notice to Airmen").

(13) Commissioning of the facility.

(14) An acceptable procedure for amending or revising the manual.

(15) The following information concerning the facility:

(i) Location by latitude and longitude to the nearest second, and its position with respect to airport layouts.

(ii) The type, make, and model of the basic radio equipment that will provide the service.

(iii) The station power emission and frequency.

(iv) The hours of operation.

(v) Station identification call letters and methods of station identification, whether by Morse Code or recorded voice announcement, and the time spacing of the identification.

(c) If the owner desires to modify the facility, he shall submit the proposal to the Federal Aviation Administration and meet applicable requirements of the Federal Communications Commission, and must parts, of such a quantity to make possible the prompt replacement of components that fail or deteriorate in service.

(f) The owner shall shut down the facility by ceasing radiation, and shall issue a "Notice to Airmen" that the facility is out of service (except that private use facilities may omit "Notices to Airmen") upon receiving two successive pilot reports of its malfunctioning.

(Amdt. 171–7, Eff. 9/9/70)

§ 171.213 Reports.

The owner of each facility to which this subpart applies shall make the following reports, at the times indicated, to the Federal Aviation Administration Regional Office for the area in which the facility is located:

(a) Record of meter readings and adjustments (Form FAA–198). To be filled out by the owner or his maintenance representative with the equipment adjustments and meter readings as of the time of commissioning, with one copy to be kept in the permanent records of the facility and two copies to the appropriate Regional Office of the Federal Aviation Administration. The owner must revise the form after any major repair, modification, or retuning, to reflect an accurate record of facility operation and adjustment.

(b) Facility maintenance log (FAA Form 6030–1). This form is a permanent record of all equipment malfunctioning met in maintaining the facility, including information on the kind of work and adjustments made, equipment failures, causes (if determined), and corrective action taken. The owner shall keep the original of each report at the facility and send a copy to the appropriate Regional Office of the Federal Aviation Administration at the end of the month in which it is prepared.

(c) Radio equipment operation record (Form FAA–418), containing a complete record of meter readings, recorded on each scheduled visit to the facility. The owner shall keep the original of each month's record at the facility and send a copy of it to the appropriate Regional Office of the Federal Aviation Administration.

§ 171.251 Scope.

This subpart sets forth minimum requirements for the approval and operation of non-Federal Interim Standard Microwave Landing System (ISMLS) facilities that are to be involved in the approval of instrument flight rules and air traffic control procedures related to those facilities.

§ 171.253 Definitions.

As used in this subpart:

"Angular displacement sensitivity" (Glide Slope) means the ratio of measured DDM to the corresponding angular displacement from the appropriate reference line.

"Collocated ground station" means the type of ground station which transmits two or more guidance signals simultaneously from a common location.

"Course line" means the locus of points nearest to the runway centerline in any horizontal plane at which the DDM is zero.

"Course sector (full)" means a sector in a horizontal plane containing the course line and limited by the loci of points nearest to the course line at which the DDM is 0.155.

"Course sector (half)" means the sector in a horizontal plane containing the course line and limited by the loci of points nearest to the course line at which DDM is 0.0775.

"DDM" means difference in depth of modulation. The percentage modulation depth of the larger signal minus the percentage modulation depth of the smaller signal, divided by 100.

"Displacement sensitivity" (Localizer) means the ratio of measured DDM to the corresponding lateral displacement from the appropriate reference line.

"Facility Performance Category I—ISMLS" means an ISMLS which provides guidance information from the coverage limit of the ISMLS to the point at which the localizer course line intersects the ISMLS glide path at a height of 200 feet or vertical plane containing the runway center line at which the DDM is zero, which, of all such loci, is the closest to the horizontal plane.

"Glide path angle" (θ) means the angle between a straight line which represents the mean of the ISMLS glide path and the horizontal.

"Glide path sector (full)" means the sector in the vertical plane containing the ISMLS glide path and limited by the loci of points nearest to the glide path at which the DDM is 0.175. The ISMLS glide path sector is located in the vertical plane containing the runway centerline, and is divided by the radiated glide path in two parts called upper sector and lower sector, referring respectively to the sectors above and below the glide path.

"Glide path sector (half)" means the sector in the vertical plane containing the ISMLS glide path and limited by the loci of points nearest to the glide path at which the DDM is 0.0875.

"ISMLS Point 'A'" means an imaginary point on the glide path/localizer course measured along the runway centerline extended, in the approach direction, four nautical miles from the runway threshold.

"ISMLS Point 'B'" means an imaginary point on the glide path/localizer course measured along the runway centerline extended, in the approach direction, 3500 feet from the runway threshold.

"ISMLS Point 'C'" means a point through which the downward extended straight portion of the glide path (at the commissioned angle) passes at a height of 100 feet above the horizontal plane containing the runway threshold.

"Interim standard microwave landing system" (ISMLS) means a ground station which transmits azimuth and elevation angle information which, when decoded and processed by the airborne unit, provides signal performance capable of supporting approach minima for V/STOL and CTOL operations and operates with the signal format and tolerances specified in §§ 171.259, 171.261, 171.263, 171.265, and 171.267.

"Reference datum" means a point at a specified height located vertically above the intersection of the runway centerline and the threshold and through which the downward extended straight portion of the ISMLS glide path passes.

"Split type ground station" means the type of ground station in which the electronic components for the azimuth and elevation guidance are contained in separate housings or shelters at different locations, with the azimuth portion of the ground station located at the stop end of the runway, and the elevation guidance near the approach end of the runway.

§ 171.255 Requests for IFR procedures.

(a) Each person who requests an IFR procedure based on an ISMLS facility that he owns must submit the following information with that request:

(1) A description of the facility and evidence that the equipment meets the performance requirements of §§ 171.259, 171.261, 171.263, 171.265, 171.267, and 171.269, and is installed in accordance with § 171.271.

(2) A proposed procedure for operating the facility.

(3) A proposed maintenance organization and a maintenance manual that meets the requirements of § 171.273.

(4) A statement of intent to meet the requirements of this subpart.

(5) A showing that the ISMLS facility has an acceptable level of operational reliability, maintainability and acceptable standard of performance. Previous equivalent operational experience with a facility with identical design and operational characteristics will be considered in showing compliance with this paragraph.

(b) After the FAA inspects and evaluates the ISMLS facility, it advises the owner of the results and of any required changes in the ISMLS facility or in the maintenance manual or maintenance organization. The owner must then correct the deficiencies, if any, and operate the ISMLS facility for an inservice evaluation by the FAA.

(2) The installation of the equipment must meet the requirements of § 171.271.

(3) The owner must agree to operate and maintain the ISMLS facility in accordance with § 171.273.

(4) The owner must agree to furnish periodic reports as set forth in § 171.275 and agree to allow the FAA to inspect the facility and its operation whenever necessary.

(5) The owner must assure the FAA that he will not withdraw the ISMLS facility from service without the permission of the FAA.

(6) The owner must bear all costs of meeting the requirements of this section and of any flight or ground inspection made before the ISMLS facility is commissioned, except that the FAA may bear certain costs subject to budgetary limitations and policy established by the Administrator.

(b) If the applicant for approval meets the requirements of paragraph (a) of this section, the FAA approves the ISMLS facility for use in an IFR procedure. The approval is withdrawn at any time that the ISMLS facility does not continue to meet those requirements. In addition, the ISMLS facility may be de-commissioned whenever the frequency channel is needed for higher priority common system service.

§ 171.259 Performance requirements: General.

(a) The ISMLS consists of the following basic components:

(1) C-Band (5000 MHz–5030 MHz) localizer equipment, associated monitor system, and remote indicator equipment;

(2) C-Band (5220 MHz–5250 MHz) glide path equipment, associated monitor system, and remote indicator equipment;

(3) VHF marker beacons (75 MHz), associated monitor systems, and remote indicator equipment.

(4) An ISMLS airborne receiver or a VHF/UHF ILS receiver modified to be capable of receiving the ISMLS signals. This modification requires the addition of a C-Band antenna, a con-

and duty:

120 V nominal value, 102 V to 138 V (±1 V).*
208 V nominal value, 177 V to 239 V (±2 V).*
240 V nominal value, 204 V to 276 V (±0.2 V).*
AC line frequency (60 Hz), 57 Hz to 63 Hz (±0.2 Hz).*
DC voltage (48 V), 44 V to 52 V (±0.5 V).*

*NOTE: Where discrete values of the above frequency or voltages are specified for testing purposes, the tolerances given in parentheses indicated by an asterisk apply to the test instruments used to measure these parameters.

Elevation, 0 to 10,000 ft. above sea level.
Duty, continuous, unattended.

(2) Ambient conditions for localizer and glide path equipment:

Temperature, −10° C to +50° C.
Relative humidity, 5% to 90%.

(3) Ambient conditions for marker beacon facilities and all other equipment installed outdoors (for example, antennae, field detectors, and shelters):

Temperature, −50° C. to +70° C.
Relative humidity, 5% to 100%.

(4) All equipment installed outdoors must operate satisfactorily under the following conditions:

Wind velocity, 0–100 MPH (not including gusts).
Hail stones, ½″ diameter.
Rain, provide coverage through a distance of 5 nautical miles with rain falling at a rate of 50 millimeters per hour, and with rain falling at the rate of 25 millimeters per hour for the additional design performance range of the system.
Ice loading, encased in ½″ radial thickness of clear ice.

(d) The ISMLS must perform in accordance with the following standards and practices for Facility Performance Category I operation:

(1) The ISMLS must be constructed and adjusted so that, at a specified distance from the ments specified herein. The marker beacon components listed in paragraph (a)(3) of this section which form part of an ISMLS, must comply at least with the standard performance requirements specified in subpart H of this part.

(3) The ISMLS must be so designed and maintained that the probability of operation is within the performance requirements specified in § 171.273(k).

(e) The signal format and pairing of the runway localizer and glide path transmitter frequencies of an ISMLS must be in accordance with the frequency plan approved by the FAA, and must meet the following signal format requirements:

(1) The localizer and glide slope stations must transmit angular guidance information on a C-band microwave carrier on narrow, scanned antenna beams that are encoded to produce a modulation in space which, after averaging over several beam scans, is equivalent to the modulation used for conventional ILS as specified in Subpart C of this part, except that the frequency tolerance may not exceed ±0.0001 percent.

(2) Guidance modulation must be impressed on the microwave carrier of the radiated signal in the form of a summation of 90 Hz and 150 Hz sinusoidal modulation corresponding to the pointing direction of the particular beam which radiates the signal.

(3) Each of the effective beam positions must be illuminated in a particular sequence for a short time interval. The modulation impressed on each beam must be a sample of the combined 90 Hz and 150 Hz waveform appropriate for that particular beam direction and time slot, and must be accomplished by appropriately varying the length of time the carrier is radiated during each beam illumination interval.

(4) For those cases where the scanning beam fills the coverage space in steps, the incremental step must not exceed 0.6 times the beam width where the beam is in the proportional guidance sector. In the clearance region, the step may not exceed 0.8 times the beam width.

defined by this specification may not be less than 0.1. Detected duty ratio means the ratio of the average energy per scan detected at a point in space to the average energy per scan transmitted in all directions through the transmitting antenna.

(9) The localizer must produce a C-band unmodulated reference frequency signal of sufficient strength to allow satisfactory operation of an aircraft receiver within the specified localizer and glide path coverage sectors. Pairing of this reference frequency with the localizer and glide slope frequencies must be in accordance with a frequency plan approved by the FAA.

§ 171.261 Localizer performance requirements.

This section prescribes the performance requirements for localizer equipment components of the ISMLS.

(a) The localizer antenna system must:

(1) Be located on the extension of the centerline of the runway at the stop end;

(2) Be adjusted so that the course line be on a vertical plane containing the centerline of the runway served;

(3) Have the minimum height necessary to comply with the coverage requirements prescribed in paragraph (j) of this section;

(4) Be located at a distance from the stop end of the runway that is consistent with safe obstruction clearance practices;

(5) Not obscure any light of the approach landing system; and

(6) Be installed on frangible mounts or beyond the 1000′ light bar.

(b) On runways where limited terrain prevents the localizer antennae from being positioned on the runway centerline extended, and the cost of the land fill or a tall tower antenna support is prohibitive, the localizer antenna array may be offset, including a collocated ground station, so that the course intercepts the centerline at a point determined by the amount of the angular offset and the glide path angle. If other than a runway center-

equivalent to amplitude modulation by a 90 Hz and 150 Hz tone. The localizer station must transmit angular guidance information over a C-band microwave carrier on narrow, scanned antenna beams that are encoded to produce a modulation in space which, after averaging over several beam scans, is equivalent to the modulation used for conventional ILS as specified in Subpart C of this part. The radiation field pattern must produce a course sector with one tone predominating on one side of the course and with the other tone predominating on the opposite side. When an observer faces the localizer from the approach end of the runway, the depth of modulation of the radio frequency carrier due to the 150 Hz tone must predominate on his right hand and that due to the 90 Hz tone must predominate on his left hand.

(e) All horizontal angles employed in specifying the localizer field patterns must originate from the center of the localizer antenna system which provides the signals used in the front course sector.

(f) The ISMLS course sector angle must be adjustable between 3 degrees and 9 degrees. The applicable course sector angle will be established and approved on an individual basis.

(g) The ISMLS localizer must operate in the band 5000 MHz to 5030 MHz. The frequency tolerance may not exceed ±0.0001 percent.

(h) The emission from the localizer must be vertically polarized. The horizontally polarized component of the radiation of the course line may not exceed that which corresponds to a DDM error of 0.016 when an aircraft is positioned on the course line and is in a roll attitude of 20 degrees from the horizontal.

(i) The localizer must provide signals sufficient to allow satisfactory operation of a typical aircraft installation within the localizer and glide path coverage sectors. The localizer coverage sector must extend from the center of the localizer antenna system to distances of 18 nautical miles minimum within ±10 degrees from the front course line, and 10 nautical miles minimum between ±10 degrees and ±35 degrees from the front course line. The ISMLS localizer signals must be receivable at the distances specified up from a surface extending out-

The amplitude referred to is the DDM due to bends as realized on the mean ISMLS glide path correctly adjusted. In regions of the approach where ISMLS glide path curvature is significant, bend amplitude is calculated from the mean curved path, and not the downward extended straight line.

(j) Guidance modulation must be impressed on the microwave carrier of the radiated glide slope signal in the form of a unique summation of 90 Hz and 150 Hz sinusoidal modulation corresponding to the point direction of the particular beam which radiates the signal. Each of the effective beam positions must be illuminated in sequence for a short time interval. The scan rate must be synchronous with the 90 and 150 Hz tone base. The modulation impressed on each beam must be a sample of the combined 90 Hz and 150 Hz waveform appropriate for that particular beam direction and time slot. The actual modulation must be accomplished by appropriately varying the length of time the carrier is radiated during each beam illumination interval.

(k) The nominal depth of modulation of the radio frequency carrier due to each of the 90 Hz and 150 Hz tones must be 40 percent along the ISMLS glide path. The depth of modulation may not deviate outside the limits of 37.5 percent to 42.5 percent.

(l) The following tolerances apply to the frequencies of the modulating tones:

(1) The modulating tones must be 90 Hz and 150 Hz within 2.5 percent.

(2) The total harmonic content of the 90 Hz tone may not exceed 10 percent.

(3) The total harmonic content of the 150 Hz tone may not exceed 10 percent.

(m) At every half cycle of the combined 90 Hz and 150 Hz wave form, the modulation must be phase-locked so that, within the ISMLS half glide path sector, the demodulated 90 Hz and 150 Hz wave forms pass through zero in the same direction within 20 degrees of phase relative to the 150 Hz component. However, the phase need not be measured within the ISMLS half glide path sector.

(o) The DDM below the ISMLS glide path must increase smoothly for decreasing angle until a value of 0.22 DDM is reached. This value must be achieved at an angle not less than 0.30θ above the horizontal. However, if it is achieved at an angle above 0.45θ, the DDM value may not be less than 0.22 at least down to an angle of 0.45θ.

§ 171.267 Glide path automatic monitor system.

(a) The ISMLS glide path equipment must provide an automatic monitor system that transmits a warning to designated local and remote control points when any of the following occurs:

(1) A shift of the mean ISMLS glide path angle equivalent to more than 0.075θ.

(2) For glide paths in which the basic functions are provided by the use of a single frequency system, a reduction of power output to less than 50 percent.

(3) A change of the angle between the glide path and the line below the glide path (150 Hz predominating), at which a DDM of 0.0875 is realized by more than $\pm 0.0375\theta$.

(4) Lowering of the line beneath the ISMLS glide path at which a DDM of 0.0875 is realized to less than 0.75θ from the horizontal.

(5) Failure of any part of the monitor itself. Such failure must automatically produce the same results as the malfunctioning of the element being monitored.

(b) At glide path facilities where the selected nominal angular displacement sensitivity corresponds to an angle below the ISMLS glide path, which is close to or at the maximum limits specified, an adjustment to the monitor operating limits may be made to protect against sector deviations below 0.75θ from the horizontal.

(c) Within 10 seconds of the occurrence of any of the conditions prescribed in paragraph (a) of this section, including periods of zero radiation, glide path signal radiation must cease.

nature, located, constructed, and installed according to accepted good engineering practices, applicable electric and safety codes, FCC licensing requirements, and paragraphs (a) and (c) of § 171.261.

(b) The ISMLS facility must have a reliable source of suitable primary power, either from a power distribution system or locally generated. Adequate power capacity must be provided for the operation of test and working equipment of the ISMLS.

(c) The ISMLS facility must have a continuously engaged or floating battery power source for the ground station for continued normal operation if the primary power fails. A trickle charge must be supplied to recharge the batteries during the period of available primary power. Upon loss and subsequent restoration of power, the batteries must be restored to full charge within 24 hours. When primary power is applied, the state of the battery charge may not affect the operation of the ISMLS ground station. The battery must permit continuation of normal operation for at least two hours under the normal operating conditions. The equipment must meet all specification requirements with or without batteries installed.

(d) There must be a means for determining, from the ground, the performance of the equipment including antennae, both initially and periodically.

(e) The facility must have, or be supplemented by, ground-air or landline communications services. At facilities within or immediately adjacent to air traffic control areas, and that are intended for use as instrument approach aids for an airport, there must be ground-air communications or reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communication facility. Compliance with this paragraph need not be shown at airports where an adjacent Federal Aviation Administration facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to air traffic control zones or areas, and where extensive delays are not a factor, the requirements of this paragraph may be reduced to reliable communications (at least a ***ices. At facilities within or immediately adjacent to controlled airspace and that are intended for use as instrument approach aids for an airport, there must be ground-air communications or reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communication facility. Compliance with this paragraph need not be shown at airports where an adjacent Federal Aviation Administration facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to controlled airspace, and where extensive delays are not a factor, the requirements of this paragraph may be reduced to reliable communications (at least a landline telephone) from the airport to the nearest Federal Aviation Administration air traffic control or communications facility, if an adjacent Federal Aviation Administration facility can communicate with aircraft during the proposed instrument approach procedure, at least down to the minimum en route altitude for the controlled area.***]

(f) Except where no operationally harmful interference will result, at locations where two separate ISMLS facilities serve opposite ends of a single runway, an interlock must ensure that only the facility serving the approach direction in use can radiate.

[(Amdt. 171–16, Eff. 9/16/93)]

§ 171.273 Maintenance and operations requirements.

(a) The owner of the facility must establish an adequate maintenance system and provide qualified maintenance personnel to maintain the facility at the level attained at the time it was commissioned. Each person who maintains a facility must meet at least the Federal Communications Commission's licensing requirements and show that he has the special knowledge and skills needed to maintain the facility, including proficiency in maintenance procedures and the use of specialized test equipment.

(k) The minimum peak field strength on the ISMLS glide path and within the localizer course sector from a distance of 10 nautical miles to a height of 100 feet (30 meters) above the horizontal plane containing the threshold, may not be less than +87 dBW/m^2.

(l) Above 16 degrees, the ISMLS localizer signals must be reduced to as low a value as practicable.

(m) Bends in the course line may not have amplitudes which exceed the following:

Zone	Amplitude (DDM) (95 pct. probability)
Outer limit of coverage to:	
ISMLS point "A"	0.031.
ISMLS point "A" to ISMLS point "B".	0.031 at ISMLS point "A" decreasing at linear rate to 0.015 at ISMLS point "B".
ISMLS point "B" to ISMLS point "C".	0.015.

(n) The amplitudes referred to in paragraph (m) of this section are the DDMs due to bends as realized on the mean course line, when correctly adjusted.

(o) The radio frequency carrier must meet the following requirements:

(1) The nominal depth of modulation of the radio frequency carrier due to each of the 90 Hz and 150 Hz tones must be 20 percent along the course line.

(2) The depth of modulation of the radio frequency carrier due to each of the 90 Hz and 150 Hz tones must be between 18 and 22 percent.

(3) The frequency tolerance of the 90 Hz and 150 Hz modulated tones must be within ±25 percent.

(4) Total harmonic content of the 90 Hz tone may not exceed 10 percent.

(5) Total harmonic content of the 150 Hz tone may not exceed 10 percent. However, a 300 Hz tone may be transmitted for identification purposes.

(p) The mean course line must be adjusted and maintained within ±.015DDM from the runway centerline at the ISMLS reference datum.

(q) The nominal displacement sensitivity within the half course sector at the ISMLS reference datum, must be 0.00145 DDM/meter (0.00044DDM/foot). However, where the specified nominal displacement sensitivity cannot be met, the displacement sensitivity must be adjusted as near as possible to that value.

(r) The lateral displacement sensitivity must be adjusted and maintained within 17 percent of the nominal value. Nominal sector width at the ISMLS reference datum is 210 meters (700 feet).

(s) The increase of DDM must be substantially linear with respect to angular displacement from the front course line where DDM is zero, up to angle on either side of the front course line where the DDM is 0.180. From that angle to ±10 degrees, the DDM may not be less than 0.180. From ±10 degrees to ±35 degrees, the DDM may not be less than 0.155.

(t) The localizer must provide for the simultaneous transmission of an identification signal which meets the following:

(1) It must be specific to the runway and approach direction, on the same radio frequency carrier, as used for the localizer function.

(2) Transmission of the identification signal may not interfere in any way with the basic localizer function.

(3) The signal must be produced by pulse duration modulation of the radio frequency carrier resulting in a detected audio tone in the airborne VHF receiver of 1020 Hz ±50Hz.

(4) The depth of modulation must be between the limits of 10 and 12 percent.

(5) The emissions carrying the identification signal must be vertically polarized.

(6) The identification signal must employ the International Morse Code and consist of three letters. It must be preceded by the International Morse Code signal of the letter "M" followed by a short pause where it is necessary to distinguish the ISMLS facility from other navigational

able for operational use. When the localizer is not available for transmission, the identification signal must be suppressed.

§ 171.263 Localizer automatic monitor system.

(a) The ISMLS localizer equipment must provide an automatic monitor system that transmits a warning to designated local and remote control points when any of the following occurs:

(1) A shift of the mean course line of the localizer from the runway centerline equivalent to more than 0.015 DDM at the ISMLS reference datum.

(2) For localizers in which the basic functions are provided by the use of a single-frequency system, a reduction of power output to less than 50 percent of normal or a loss of ground station identification transmissions.

(3) Changes of displacement sensitivity to a value differing by more than 17 percent from nominal value for the localizer.

(4) Failure of any part of the monitor itself. Such failure must automatically produce the same results as the malfunctioning of the element being monitored.

(b) Within 10 seconds of the occurrence of any of the conditions prescribed in paragraph (a) of this section, including periods of zero radiation, localizer signal radiation must cease or the navigation and identification components must be removed.

§ 171.265 Glide path performance requirements.

This section prescribes the performance requirements for glide path equipment components of the ISMLS. These requirements are based on the assumption that the aircraft is heading directly toward the facility.

(a) The glide slope antenna system must be located near the approach end of the runway, and the equipment must be adjusted so that the vertical path line will be in a sloping horizontal plane containing the centerline of the runway being served, and satisfy the coverage requirements prescribed in paragraph (g) of this section. For the purpose of must be arranged to provide a straight line descent path in the vertical plane containing the centerline of the runway, with the 150 Hz tone predominating below the path and the 90 Hz tone predominating above the path to at least an angle equal to 1.75θ. As used in this section theta (θ), denotes the nominal glide path angle. The glide path angle must be adjusted and maintained within 0.075θ.

(c) The glide path equipment must be capable of producing a radiated glide path from 3 to 9 degrees with respect to the horizontal. However, ISMLS glide path angles in excess of 3 degrees may be used to satisfy instrument approach procedures or to overcome an obstruction clearance problem, only in accordance with the criteria specified in Subpart C of Part 97 of this chapter.

(d) The downward extended straight portion of the ISMLS glide path must pass through the ISMLS reference datum at a height ensuring safe guidance over obstructions and safe and efficient use of the runway served. The height of the ISMLS reference datum must be in accordance with Subpart C of Part 97 of this chapter.

(e) The glide path equipment must operate in the band 5220 MHz to 5250 MHz. The frequency tolerance may not exceed ±0.0001 percent.

(f) The emission from the glide path equipment must be vertically polarized.

(g) The glide path equipment must provide signals sufficient to allow satisfactory operation of a typical aircraft installation insectors of 8 degrees on each side of the centerline of the ISMLS glide path, to a distance of at least 10 nautical miles up to 1.75θ and down to 0.45θ above the horizontal or to such lower angle at which 0.22 DDM is realized.

(h) To provide the coverage for glide path performance specified in paragraph (g) of this section, the minimum peak field strength within this coverage sector must be -82 dBW/m^2. The peak field strength must be provided on the glide path down to a height of 30 meters (100 feet) above the horizontal plane containing the threshold.

maintenance, and emergency maintenance, including instructions on each of the following:

(1) Physical security of the facility.

(2) Maintenance and operations by authorized persons.

(3) FCC licensing requirements for operations and maintenance personnel.

(4) Posting of licenses and signs.

(5) Relation between the facility and FAA air traffic control facilities, with a description of the boundaries of controlled airspace over or near the facility, instructions for relaying air traffic control instructions and information, if applicable, and instructions for the operation of an air traffic advisory service if the facility is located outside of controlled airspace.

(6) Notice to the Administrator of any suspension of service.

(7) Detailed and specific maintenance procedures and servicing guides stating the frequency of servicing.

(8) Air-ground communications, if provided, expressly written or incorporating appropriate sections of FAA manuals by reference.

(9) Keeping of station logs and other technical reports, and the submission of reports required by § 171.275.

(10) Monitoring of the ISMLS facility.

(11) Inspections by United States personnel.

(12) Names, addresses, and telephone numbers of persons to be notified in an emergency.

(13) Shutdowns for periodic maintenance and issue of "Notices to Airmen" for routine or emergency shutdowns.

(14) Commissioning of the ISMLS facility.

(15) An acceptable procedure for amending or revising the manual.

(16) An explanation of the kinds of activities (such as construction or grading) in the vicinity of the ISMLS facility that may require shutdown or recertification of the ISMLS facility by FAA flight check.

(17) Procedures for conducting a ground check of the localizer course alignment, width, and clear-

(iii) The station power emission and frequencies of the ISMLS localizer, glide path, beacon markers, and associated compass locators, if any.

(iv) The hours of operation.

(v) Station identification call letters and method of station identification and the time spacing of the identification.

(vi) A description of the critical parts that may not be changed, adjusted, or repaired without an FAA flight check to confirm published operations.

(d) The owner or his maintenance representative must make a ground check of the ISMLS facility periodically in accordance with procedures approved by the FAA at the time of commissioning, and must report the results of the checks as provided in § 171.275.

(e) Modifications to an ISMLS facility may be made only after approval by the FAA of the proposed modification submitted by the owner.

(f) The owner or the owner's maintenance representative must participate in inspections made by the FAA.

(g) Whenever it is required by the FAA, the owner must incorporate improvements in ISMLS maintenance.

(h) The owner or his maintenance representative must provide a sufficient stock of spare parts, including solid state components, or modules to make possible the prompt replacement of components or modules that fail or deteriorate in service.

(i) FAA approved test instruments must be used for maintenance of the ISMLS facility.

(j) The mean corrective maintenance time of the ISMLS equipment may not exceed 0.5 hours, with a maximum corrective maintenance time of not greater than 1.5 hours. This measure applies to failures of the monitor, transmitter and associated antenna assemblies, limited to unscheduled outage and out-of-tolerance conditions.

(k) The mean time between failures of the ISMLS equipment may not be less than 1,500 hours. This measure applies to unscheduled outages,

the in-service test evaluation period for calibration and stability. These tests and ground checks of glide slope, localizer, and marker beacon radiation characteristics must be conducted in accordance with the maintenance requirements of this section.

§ 171.275 Reports.

The owner of the ISMLS facility or his maintenance representative must make the following reports at the indicated time to the appropriate FAA Regional Office where the facility is located.

(a) *Facility Equipment Performance and Adjustment Data (FAA Form 198).* The FAA Form 198 shall be filled out by the owner or his maintenance representative with the equipment adjustments and meter readings as of the time of facility commissioning. One copy must be kept in the permanent records of the facility and two copies must be sent to the appropriate FAA Regional Office. The owner or his maintenance representative must revise the FAA Form 198 data after any major repair, modernization, or retuning to reflect an accurate record of facility operation and adjustment. In the event

met in maintaining the facility including information on the kind of work and adjustments made, equipment failures, causes (if determined) and corrective action taken. In addition, the entries must include completion of periodic maintenance required to maintain the facility. The owner or his maintenance representative must keep the original of each form at the facility and send a copy to the appropriate FAA Regional Office at the end of each month in which it is prepared. However, where an FAA approved remote monitoring system is installed which precludes the need for periodic maintenance visits to the facility, monthly reports from the remote monitoring system control point must be forwarded to the appropriate FAA Regional Office, and a hard copy retained at the control point.

(c) *Technical Performance Record (FAA Form 418).* FAA Form 418 contains a record of system parameters, recorded on each scheduled visit to the facility. The owner or his maintenance representative shall keep the original of each month's record at the facility and send a copy of the form to the appropriate FAA Regional Office.

§ 171.301 Scope.

This subpart sets forth minimum requirements for the approval, installation, operation and maintenance of non-Federal Microwave Landing System (MLS) facilities that provide the basis for instrument flight rules (IFR) and air traffic control procedures.

§ 171.303 Definitions.

As used in this subpart:

Auxiliary data means data transmitted in addition to basic data that provide ground equipment siting information for use in refining airborne position calculations and other supplementary information.

Basic data means data transmitted by the ground equipment that are associated directly with the operation of the landing guidance system.

Beam center means the midpoint between the –3 dB points on the leading and trailing edges of the scanning beam main lobe.

Beamwidth means the width of the scanning beam main lobe measured at the –3 dB points and defined in angular units on the boresight, in the horizontal plane for the azimuth function and in the vertical plane for the elevation function.

Clearance guidance sector means the volume of airspace, inside the coverage sector, within which the azimuth guidance information provided is not proportional to the angular displacement of the aircraft, but is a constant fly-left or fly-right indication of the direction relative to the approach course the aircraft should proceed in order to enter the proportional guidance sector.

Control Motion Noise (CMN) means those fluctuations in the guidance which affect aircraft attitude, control surface motion, column motion, and wheel motion. Control motion noise is evaluated by filtering the flight error record with a bandpass filter which has corner frequencies at 0.3 radian/sec and 10 radians/sec for azimuth data and 0.5 radian/sec and 10 radians/sec for elevation data.

Differential Phase Shift Keying (DPSK) means differential phase modulation of the radio frequency carrier with relative phase states of 0 degree or 180 degrees.

Failure means the inability of an item to perform within previously specified limits.

Guard time means an unused period of time provided in the transmitted signal format to allow for equipment tolerances.

Integrity means that quality which relates to the trust which can be placed in the correctness of the information supplied by the facility.

Mean corrective time means the average time required to correct an equipment failure over a given period, after a service technician reaches the facility.

Mean course error means the mean value of the azimuth error along a specified radial of the azimuth function.

Mean glide path error means the mean value of the elevation error along a specified glidepath of the elevation function.

Mean-time-between-failures (MTBF) means the average time between equipment failures over a given period.

Microwave Landing System (MLS) means the MLS selected by ICAO for international standardization.

Minimum glidepath means the lowest angle of descent along the zero degree azimuth that is consistent with published approach procedures and obstacle clearance criteria.

MLS Approach Reference Datum is a point at a specified height located vertically above the intersection of the runway centerline and the threshold.

MLS back azimuth reference datum means a point 15 meters (50 feet) above the runway centerline at the runway midpoint.

MLS datum point means a point defined by the intersection of the runway centerline with a vertical plane perpendicular to the centerline and passing through the elevation antenna phase center.

mean course error in the case of azimuth functions, or the mean glidepath error in the case of elevation functions. Path following errors are evaluated by filtering the flight error record with a second order low pass filter which has a corner frequency at 0.5 radian/sec for azimuth data or 1.5 radians/sec for elevation data.

Path following noise (PFN) means that portion of the guidance signal error which could cause displacement from the actual mean course line or mean glidepath as appropriate.

Split-site ground station means the type of ground station in which the azimuth portion of the ground station is located near the stop end of the runway, and the elevation portion is located near the approach end.

Time division multiplex (TDM) means that each function is transmitted on the same frequency in time sequence, with a distinct preamble preceding each function transmission.

§ 171.305 Requests for IFR procedure.

(a) Each person who requests an IFR procedure based on an MLS facility which that person owns must submit the following information with that request:

(1) A description of the facility and evidence that the equipment meets the performance requirements of §§ 171.309, 171.311, 171.313, 171.315, 171.317, 171.319, and 171.321 and is fabricated and installed in accordance with § 171.323.

(2) A proposed procedure for operating the facility.

(3) A proposed maintenance organization and a maintenance manual that meets the requirements of § 171.325.

(4) A statement of intent to meet the requirements of this subpart.

(5) A showing that the facility has an acceptable level of operational reliability and an acceptable standard of performance. Previous equivalent operational experience with a facility with identical design and operational characteristics will

§ 171.307 Minimum requirements for approval.

(a) The following are the minimum requirements that must be met before the FAA approves an IFR procedure for a non-Federal MLS facility:

(1) The performance of the MLS facility, as determined by flight and ground inspection conducted by the FAA, must meet the requirements of §§ 171.309, 171.311, 171.313, 171.315, 171.317, 171.319, and 171.321.

(2) The fabrication and installation of the equipment must meet the requirements of § 171.323.

(3) The owner must agree to operate and maintain the MLS facility in accordance with § 171.325.

(4) The owner must agree to furnish operational records as set forth in § 171.327 and agree to allow the FAA to inspect the facility and its operation whenever necessary.

(5) The owner must assure the FAA that he will not withdraw the MLS facility from service without the permission of the FAA.

(6) The owner must bear all costs of meeting the requirements of this section and of any flight or ground inspection made before the MLS facility is commissioned.

(b) [Reserved]

§ 171.309 General requirements.

The MLS is a precision approach and landing guidance system which provides position information and various ground-to-air data. The position information is provided in a wide coverage sector and is determined by an azimuth angle measurement, an elevation angle measurement and a range (distance) measurement.

(a) An MLS constructed to meet the requirements of this subpart must include:

(1) Approach azimuth equipment, associated monitor, remote control and indicator equipment.

(2) Approach elevation equipment, associated monitor, remote control and indicator equipment.

(3), and (4) of this section must include as a minimum on/off and reset capabilities and may be integrated in the same equipment.

(6) At locations where a VHF marker beacon (75 MHz) is already installed, it may be used in lieu of the DME equipment.

(b) In addition to the equipment required in paragraph (a) of this section the MLS may include:

(1) Back azimuth equipment, associated monitor, remote control and indicator equipment. When Back Azimuth is provided, a means for transmission of Basic Data Word 5 and Auxiliary Data Word A4 shall also be provided.

(2) A wider proportional guidance sector which exceeds the minimum specified in §§ 171.313 and 171.317.

(3) Precision DME, associated monitor, remote control and indicator equipment.

(4) VHF marker beacon (75 MHz), associated monitor, remote control and indicator equipment.

(5) The MLS signal format will accommodate additional functions (e.g., flare elevation) which may be included as desired. Remote controls for paragraphs (b) (1), (3) and (4) of this section must include as a minimum on/off and reset capabilities, and may be integrated in the same equipment.

(6) Provisions for the encoding and transmission of additional auxiliary data words, associated monitor, remote control and indicator equipment.

(c) MLS ground equipment must be designed to operate on a nominal 120/240 volt, 60 Hz, 3-wire single phase AC power source and must meet the following service conditions:

(1) AC line parameters, DC voltage, elevation and duty:

120 VAC nominal value—102 V to 138 V (±1 V)*
240 VAC nominal value—204 V to 276 V (±2 V)*
60 Hz AC line frequency—57 Hz to 63 Hz (±0.2 Hz)*

*NOTE: Where discrete values of the above frequency or voltages are specified for testing purposes, the tolerances given in parentheses indicated by an asterisk apply to the test instruments used to measure these parameters.

Elevation—0 to 3000 meters (10,000 feet) above sea level
Duty—Continuous, unattended
Temperature, −50°C to +70°C
Relative humidity, 5% to 100%

(4) All equipment installed outdoors must operate satisfactorily under the following conditions:

Wind Velocity: The ground equipment shall remain within monitor limits with wind velocities of up to 70 knots from such directions that the velocity component perpendicular to runway centerline does not exceed 35 knots. The ground equipment shall withstand winds up to 100 knots from any direction without damage.

Hail Stones: 1.25 centimeters (½ inch) diameter.

Rain: Provide required coverage with rain falling at a rate of 50 millimeters (2 inches) per hour, through a distance of 9 kilometers (5 nautical miles) and with rain falling at the rate of 25 millimeters (1 inch) per hour for the additional 28 kilometers (15 nautical miles).

Ice Loading: Encased in 1.25 centimeters (½ inch) radial thickness of clear ice.

Antenna Radome De-Icing: Down to −6°C (20°F) and wind up to 35 knots.

(d) The transmitter frequencies of an MLS must be in accordance with the frequency plan approved by the FAA.

(e) The DME component listed in paragraph (a)(4) of this section must comply with the minimum standard performance requirements specified in Subpart G of this part.

(f) The marker beacon components listed in paragraph (b)(4) of this section must comply with the minimum standard performance requirements specified in Subpart H of this part.

§ 171.311 Signal format requirements.

The signals radiated by the MLS must conform to the signal format in which angle guidance functions and data functions are transmitted sequentially on the same C-band frequency. Each function is identified by a unique digital code which initializes the airborne receiver for proper processing. The signal format must meet the following minimum requirements:

(a) *Frequency assignment.* The ground components (except DME/Marker Beacon) must operate on a single frequency assignment or channel, using time division multiplexing. These components must be capable of operating on any one of the 200 channels spaced 300 KHz apart with center fre-

TABLE 1a—FREQUENCY CHANNEL PLAN

Channel No.	Frequency (MHz)
500	5031.0
501	5031.3
502	5031.6
503	5031.9
504	5032.2
505	5032.5
508	5033.4
509	5033.7
510	5034.0
511	5034.3
* * * * *	
598	5060.4
599	5060.7
600	5061.0
601	5061.3
* * * * *	
698	5090.4
699	5090.7

TABLE 1b—CHANNELS

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P Mode			
DME No.	VHF freq. MHz	MLS angle freq. MHz	MLS Ch. No.	Freq. MHz	DME/N μs	IA μs	FA μs	Freq. MHz	Pulse codes μs
*1X				1025	12			962	12
**1Y				1025	36			1088	30
*2X				1026	12			963	12
**2Y				1026	36			1089	30
*3X				1027	12			964	12
**3Y				1027	36			1090	30
*4X				1028	12			965	12
**4Y				1028	36			1091	30
*5X				1029	12			966	12
**5Y				1029	36			1092	30
*6X				1030	12			967	12
**6Y				1030	36			1093	30
*7X				1031	12			968	12
**7Y				1031	36			1094	30
*8X				1032	12			969	12
**8Y				1032	36			1095	30
*9X				1033	12			970	12
**9Y				1033	36			1096	30
*10X				1034	12			971	12
**10Y				1034	36			1097	30
*11X				1035	12			972	12
**11Y				1035	36			1098	30
*12X				1036	12			973	12
**12Y				1036	36			1099	30
*13X				1037	12			974	12
**13Y				1037	36			1100	30

* 14X	.....	.....	.....	.....	1038	12	.....	.....	975	12
** 14Y	.....	.....	.....	.....	1038	36	.....	.....	1101	30
* 15X	.....	.....	.....	.....	1039	12	.....	.....	976	12
** 15Y	.....	.....	.....	.....	1039	36	.....	.....	1102	30
* 16X	.....	.....	.....	.....	1040	12	.....	.....	977	12
** 16Y	.....	.....	.....	.....	1040	36	.....	.....	1103	30
▽ 17X	108.00	.....	.....	.....	1041	12	.....	.....	978	12
17Y	108.05	5043.0	540		1041	36	36	42	1104	30
17Z	.....	5043.3	541		1041	.....	21	27	1104	15
18X	108.10	5031.0	500		1042	12	12	18	979	12
18W	.....	5031.3	501		1042	.....	24	30	979	24
18Y	108.15	5043.6	542		1042	36	36	42	1105	30
18Z	.....	5043.9	543		1042	.....	21	27	1105	15
19X	108.20	.....	.....		1043	12	.....	.....	980	12
19Y	108.25	5044.2	544		1043	36	36	42	1106	30
19Z	.....	5044.5	545		1043	.....	21	27	1106	15
20X	108.30	5031.6	502		1044	12	12	18	981	12
20W	.....	5031.9	503		1044	.....	24	30	981	24
20Y	108.35	5044.8	546		1044	36	36	42	1107	30
20Z	.....	5045.1	547		1044	.....	21	27	1107	15
21X	108.40	.....	.....		1045	12	.....	.....	982	12
21Y	108.45	5045.4	548		1045	36	36	42	1108	30
21Z	.....	5045.7	549		1045	.....	21	27	1108	15
22X	108.50	5032.2	504		1046	12	12	18	983	12
22W	.....	5032.5	505		1046	.....	24	30	983	24
22Y	108.55	5046.0	550		1046	36	36	42	1109	30
22Z	.....	5046.3	551		1046	.....	21	27	1109	15
23X	108.60	.....	.....		1047	12	.....	.....	984	12
23Y	108.65	5046.6	552		1047	36	36	42	1110	30
23Z	.....	5046.9	553		1047	.....	21	27	1110	15
24X	108.70	5032.8	506		1048	12	12	18	985	12
24W	.....	5033.1	507		1048	.....	24	30	985	24
24Y	108.75	5047.2	554		1048	36	36	42	1111	30
24Z	.....	5047.5	555		1048	.....	21	27	1111	15
25X	108.80	.....	.....		1049	12	.....	.....	986	12
25Y	108.85	5047.8	556		1049	36	36	42	1112	30
25Z	.....	5048.1	557		1049	.....	21	27	1112	15
26X	108.90	5033.4	508		1050	12	12	18	987	12
26W	.....	5033.7	509		1050	.....	24	30	987	24
26Y	108.95	5048.4	558		1050	36	36	42	1113	30
26Z	.....	5048.7	559		1050	.....	21	27	1113	15
27X	109.00	.....	.....		1051	12	.....	.....	988	12
27Y	109.05	5049.0	560		1051	36	36	42	1114	30
27Z	.....	5049.3	561		1051	.....	21	27	1114	15
28X	109.10	5034.0	510		1052	12	12	18	989	12
28W	.....	5034.3	511		1052	.....	24	30	989	24
28Y	109.15	5049.6	562		1052	36	36	42	1115	30
28Z	.....	5049.9	563		1052	.....	21	27	1115	15
29X	109.20	.....	.....		1053	12	.....	.....	990	12
29Y	109.25	5050.2	564		1053	36	36	42	1116	30
29Z	.....	5050.5	565		1043	.....	21	27	1116	15

30X	109.30	5034.6	512	1054	12	12	18	991	12
30W	.....	5034.9	513	1054	.....	24	30	991	24
30Y	109.35	5050.8	566	1054	36	36	42	1117	30
30Z	.....	5051.1	567	1054	.....	21	27	1117	15
31X	109.40	.....	.....	1055	12	.....	.....	992	12
31Y	109.45	5051.4	568	1055	36	36	42	1118	30
31Z	.....	5051.7	569	1055	.....	21	27	1118	15
32X	109.50	5035.2	514	1056	12	12	18	993	12
32W	.....	5035.5	515	1056	.....	24	30	993	24
32Y	109.55	5052.0	570	1056	36	36	42	1119	30
32Z	.....	5052.3	571	1056	.....	21	27	1119	15
33X	109.60	.....	.....	1057	12	.....	.....	994	12
33Y	109.65	5052.6	572	1057	36	36	42	1120	30
33Z	.....	5052.9	573	1057	.....	21	27	1120	15
34X	109.70	5035.8	516	1058	12	12	18	995	12
34W	.....	5036.1	517	1058	.....	24	30	995	24
34Y	109.75	5053.2	574	1058	36	36	42	1121	30
34Z	.....	5053.5	575	1058	.....	21	27	1121	15
35X	109.80	.....	.....	1059	12	.....	.....	996	12
35Y	109.85	5053.8	576	1059	36	36	42	1122	30
35Z	.....	5054.1	577	1059	.....	21	27	1122	15
36X	109.90	5036.4	518	1060	12	12	18	997	12
36W	.....	5036.7	519	1060	.....	24	30	997	24
36Y	109.95	5054.4	578	1060	36	36	42	1123	30
36Z	.....	5054.7	579	1060	.....	21	27	1123	15
37X	110.00	.....	.....	1061	12	.....	.....	998	12
37Y	110.05	5055.0	580	1061	36	36	42	1124	30
37Z	.....	5055.3	581	1061	.....	21	27	1124	15
38X	110.10	5037.0	520	1062	12	12	18	999	12
38W	.....	5037.3	521	1062	.....	24	30	999	24
38Y	110.15	5055.6	582	1062	36	36	42	1125	30
38Z	.....	5055.9	583	1062	.....	21	27	1125	15
39X	110.20	.....	.....	1063	12	.....	.....	1000	12
39Y	110.25	5056.2	584	1063	36	36	42	1126	30
39Z	.....	5056.5	585	1063	.....	21	27	1126	15
40X	110.30	5037.6	522	1064	12	12	18	1001	12
40W	.....	5037.9	523	1064	.....	24	30	1001	24
40Y	110.35	5056.8	586	1064	36	36	42	1127	30
40Z	.....	5057.1	587	1064	.....	21	27	1127	15
41X	110.40	.....	.....	1065	12	.....	.....	1002	12
41Y	110.45	5057.4	588	1065	36	36	42	1128	30
41Z	.....	5057.7	589	1065	.....	21	27	1128	15
42X	110.50	5038.2	524	1066	12	12	18	1003	12
42W	.....	5038.5	525	1066	.....	24	30	1003	24
42Y	110.55	5058.0	590	1066	36	36	42	1129	30
42Z	.....	5058.3	591	1066	.....	21	27	1129	15
43X	110.60	.....	.....	1067	12	.....	.....	1004	12
43Y	110.65	5058.6	592	1067	36	36	42	1130	30
43Z	.....	5058.9	593	1067	.....	21	27	1130	15
44X	110.70	5038.8	526	1068	12	12	18	1005	12
44W	.....	5039.1	527	1068	.....	24	30	1005	24

44Y	110.75	5059.2	594	1068	36	36	42	1131	30
44Z	.....	5059.5	595	1068	.....	21	27	1131	15
45X	110.80	.....	.....	1069	12	.....	.....	1006	12
45Y	110.85	5059.8	596	1069	36	36	42	1132	30
45Z	.....	5060.1	597	1069	.....	21	27	1132	15
46X	110.90	5039.4	528	1070	12	12	18	1007	12
46W	.....	5039.7	529	1070	.....	24	30	1007	24
46Y	110.95	5060.4	598	1070	36	36	42	1133	30
46Z	.....	5060.7	599	1070	.....	21	27	1133	15
47X	111.00	.....	.....	1071	12	.....	.....	1008	12
47Y	111.05	5061.0	600	1071	36	36	42	1134	30
47Z	.....	5061.3	601	1071	.....	21	27	1134	15
48X	111.10	5040.0	530	1072	12	12	18	1009	12
48W	.....	5040.3	531	1072	.....	24	30	1009	24
48Y	111.15	5061.6	602	1072	36	36	42	1135	30
48Z	.....	5061.9	603	1072	.....	21	27	1135	15
49X	111.20	.....	.....	1073	12	.....	.....	1010	12
49Y	111.25	5062.2	604	1073	36	36	42	1136	30
49Z	.....	5062.5	605	1073	.....	21	27	1136	15
50X	111.30	5040.6	532	1074	12	12	18	1011	12
50W	.....	5040.9	533	1074	.....	24	30	1011	24
50Y	111.35	5062.8	606	1074	36	36	42	1137	30
50Z	.....	5063.1	607	1074	.....	21	27	1137	15
51X	111.40	.....	.....	1075	12	.....	.....	1012	12
51Y	111.45	5063.4	608	1075	36	36	42	1138	30
51Z	.....	5063.7	609	1075	.....	21	27	1138	15
52X	111.50	5041.2	534	1076	12	12	18	1013	12
52W	.....	5041.5	535	1076	.....	24	30	1013	24
52Y	111.55	5064.0	610	1076	36	36	42	1139	30
52Z	.....	5064.3	611	1076	.....	21	27	1139	15
53X	111.60	.....	.....	1077	12	.....	.....	1014	12
53Y	111.65	5064.6	612	1077	36	36	42	1140	30
53Z	.....	5064.9	613	1077	.....	21	27	1140	15
54X	111.70	5041.8	536	1078	12	12	18	1015	12
54W	.....	5042.1	537	1078	.....	24	30	1015	24
54Y	111.75	5065.2	614	1078	36	36	42	1141	30
54Z	.....	5065.5	615	1078	.....	21	27	1141	15
55X	111.80	.....	.....	1079	12	.....	.....	1016	12
55Y	111.85	5065.8	616	1079	36	36	42	1142	30
55Z	.....	5066.1	617	1079	.....	21	27	1142	15
56X	111.90	5042.4	538	1080	12	12	18	1017	12
56W	.....	5042.7	539	1080	.....	24	30	1017	24
56Y	111.95	5066.4	618	1080	36	36	42	1143	30
56Z	.....	5066.7	619	1080	.....	21	27	1143	15
57X	112.00	.....	.....	1081	12	.....	.....	1018	12
57Y	112.05	.....	.....	1081	36	.....	.....	1144	30
58X	112.10	.....	.....	1082	12	.....	.....	1019	12
58Y	112.15	.....	.....	1082	36	.....	.....	1145	30
59X	112.20	.....	.....	1083	12	.....	.....	1020	12
59Y	122.25	.....	.....	1083	36	.....	.....	1146	30
**60X	.....	.....	.....	1084	12	.....	.....	1021	12

** 60Y	.....	.....	.....	1084	36	.....	.....	1147	30
** 61X	.....	.....	.....	1085	12	.....	.....	1022	12
** 61Y	.....	.....	.....	1085	36	.....	.....	1148	30
** 62X	.....	.....	.....	1086	12	.....	.....	1023	12
** 62Y	.....	.....	.....	1086	36	.....	.....	1149	30
** 63X	.....	.....	.....	1037	12	.....	.....	1024	12
** 63Y	.....	.....	.....	1087	36	.....	.....	1150	30
** 64X	.....	.....	.....	1088	12	.....	.....	1151	12
** 64Y	.....	.....	.....	1088	36	.....	.....	1025	30
** 65X	.....	.....	.....	1089	12	.....	.....	1152	12
** 65Y	.....	.....	.....	1089	36	.....	.....	1026	30
** 66X	.....	.....	.....	1090	12	.....	.....	1153	12
** 66Y	.....	.....	.....	1090	36	.....	.....	1027	30
** 67X	.....	.....	.....	1091	12	.....	.....	1154	12
** 67Y	.....	.....	.....	1091	36	.....	.....	1028	30
** 68X	.....	.....	.....	1092	12	.....	.....	1155	12
** 68Y	.....	.....	.....	1092	36	.....	.....	1029	30
** 69X	.....	.....	.....	1093	12	.....	.....	1156	12
** 69Y	.....	.....	.....	1093	36	.....	.....	1030	30
70X	112.30	.....	.....	1094	12	.....	.....	1157	12
** 70Y	112.35	.....	.....	1094	36	.....	.....	1031	30
71X	112.40	.....	.....	1095	12	.....	.....	1158	12
** 71Y	112.45	.....	.....	1095	36	.....	.....	1032	30
72X	112.50	.....	.....	1096	12	.....	.....	1159	12
** 72Y	112.55	.....	.....	1096	36	.....	.....	1033	30
73X	112.60	.....	.....	1097	12	.....	.....	1160	12
** 73Y	112.65	.....	.....	1097	36	.....	.....	1034	30
74X	112.70	.....	.....	1098	12	.....	.....	1161	12
** 74Y	112.75	.....	.....	1098	36	.....	.....	1035	30
75X	112.80	.....	.....	1099	12	.....	.....	1162	12
** 75Y	112.85	.....	.....	1099	36	.....	.....	1036	30
76X	112.90	.....	.....	1100	12	.....	.....	1163	12
** 76Y	112.95	.....	.....	1100	36	.....	.....	1037	30
77X	113.00	.....	.....	1101	12	.....	.....	1164	12
** 77Y	113.05	.....	.....	1101	36	.....	.....	1038	30
78X	113.10	.....	.....	1102	12	.....	.....	1165	12
** 78Y	113.15	.....	.....	1102	36	.....	.....	1039	30
79X	113.20	.....	.....	1103	12	.....	.....	1166	12
** 79Y	113.25	.....	.....	1103	36	.....	.....	1040	30
80X	113.30	.....	.....	1104	12	.....	.....	1167	12
80Y	113.35	5067.0	620	1104	36	36	42	1041	30
80Z	.....	5067.3	621	1104	.....	21	27	1041	15
81X	113.40	.....	.....	1105	12	.....	.....	1168	12
81Y	113.45	5067.6	622	1105	36	36	42	1042	30
81Z	.....	5067.9	623	1005	.....	21	27	1042	15
82X	113.50	.....	.....	1106	12	.....	.....	1169	12
82Y	113.55	5068.2	624	1106	36	36	42	1043	30
82Z	.....	5068.5	625	1106	.....	21	27	1043	15
83X	113.60	.....	.....	1107	12	.....	.....	1170	12
83Y	113.65	5068.8	626	1107	36	36	42	1044	30
83Z	.....	5069.1	627	1107	.....	21	27	1044	15

84X	113.70	.....	.....	1108	12	.....	.....	1171	12
84Y	113.75	5069.4	628	1108	36	36	42	1045	30
84Z	.....	6069.7	629	1108	.....	21	27	1045	15
85X	113.80	.....	.....	1109	12	.....	.....	1172	12
85Y	113.85	5070.0	630	1109	36	36	42	1046	30
85Z	.....	5070.3	631	1109	.....	21	27	1046	15
86X	113.90	.....	.....	1110	12	.....	.....	1173	12
86Y	113.95	5070.6	632	1110	36	36	42	1047	30
86Z	.....	5070.9	633	1110	.....	21	27	1047	15
87X	114.00	.....	.....	1111	12	.....	.....	1174	12
87Y	114.05	5071.2	634	1111	36	36	42	1048	30
87Z	.....	5071.5	635	1111	.....	21	27	1048	15
88X	114.10	.....	.....	1112	12	.....	.....	1175	12
88Y	114.15	5071.8	636	1112	36	36	42	1049	30
88Z	.....	5072.1	637	1112	.....	21	27	1049	15
89X	114.20	.....	.....	1113	12	.....	.....	1176	12
89Y	114.25	5072.4	638	1113	36	36	42	1050	30
89Z	.....	5072.7	639	1113	.....	21	27	1050	15
90X	114.30	.....	.....	1114	12	.....	.....	1177	12
90Y	114.35	5073.0	640	1114	36	36	42	1051	30
90Z	.....	5073.3	641	1114	.....	21	27	1051	15
91X	114.40	.....	.....	1115	12	.....	.....	1178	12
91Y	114.45	5073.6	642	1115	36	36	42	1052	30
91Z	.....	5073.9	643	1115	.....	21	27	1052	15
92X	114.50	.....	.....	1116	12	.....	.....	1179	12
92Y	114.55	5074.2	644	1116	36	36	42	1053	30
92Z	.....	5074.5	645	1116	.....	21	27	1053	15
93X	114.60	.....	.....	1117	12	.....	.....	1180	12
93Y	114.65	5074.8	646	1117	36	36	42	1054	30
93Z	.....	5075.1	647	1117	.....	21	27	1054	15
94X	114.70	.....	.....	1118	12	.....	.....	1181	12
94Y	114.75	5075.4	648	1118	36	36	42	1055	30
94Z	.....	5075.7	649	1118	.....	21	27	1055	15
95X	114.80	.....	.....	1119	12	.....	.....	1182	12
95Y	114.85	5076.0	650	1119	36	36	42	1056	30
95Z	.....	5076.3	651	1119	.....	21	27	1056	15
96X	114.90	.....	.....	1120	12	.....	.....	1183	12
96Y	114.95	5076.6	652	1120	36	36	42	1057	30
96Z	.....	5076.9	653	1120	.....	21	27	1057	15
97X	115.00	.....	.....	1121	12	.....	.....	1184	12
97Y	115.05	5077.2	654	1121	36	36	42	1058	30
97Z	.....	5077.5	655	1121	.....	21	27	1058	15
98X	115.10	.....	.....	1122	12	.....	.....	1185	12
98Y	115.15	5077.8	656	1122	36	36	42	1059	30
98Z	.....	5078.1	657	1122	.....	21	27	1059	15
99X	115.20	.....	.....	1123	12	.....	.....	1186	12
99Y	115.25	5078.4	658	1123	36	36	42	1060	30
99Z	.....	5078.7	659	1123	.....	21	27	1060	15
100X	115.30	.....	.....	1124	12	.....	.....	1187	12
100Y	115.35	5079.0	660	1124	36	36	42	1061	30
100Z	.....	5079.3	661	1124	.....	21	27	1061	15

101X	115.40	.....	.....	1125	12	.....	.....	1188	12
101Y	115.45	5079.6	662	1125	36	36	42	1062	30
101Z	.....	5079.9	663	1125	.....	21	27	1062	15
102X	115.50	.....	.....	1126	12	.....	.....	1189	12
102Y	115.55	5080.2	664	1126	36	36	42	1063	30
102Z	.....	5080.5	665	1126	.....	21	27	1063	15
103X	115.60	.....	.....	1127	12	.....	.....	1190	12
103Y	115.65	5080.B	666	1127	36	36	42	1064	30
103Z	.....	5081.1	667	1127	.....	21	27	1064	19
104X	115.70	.....	.....	1128	12	.....	.....	1191	12
104Y	115.75	5081.4	668	1128	36	36	42	1065	30
104Z	.....	5081.7	669	1128	.....	21	27	1065	19
105X	115.80	.....	.....	1129	12	.....	.....	1192	12
105Y	115.85	5082.0	670	1129	36	36	42	1066	30
105Z	.....	5082.3	671	1129	.....	21	27	1066	15
106X	115.90	.....	.....	1130	12	.....	.....	1193	12
106Y	115.95	5082.6	672	1130	36	36	42	1067	30
106Z	.....	5082.9	673	1130	.....	21	27	1067	15
107X	116.00	.....	.....	1131	12	.....	.....	1194	12
107Y	116.05	5083.2	674	1131	36	36	42	1068	30
107Z	.....	5083.5	675	1131	.....	21	27	1068	15
108X	116.10	508	.....	1132	12	.....	.....	1195	12
108Y	116.15	5083.8	676	1132	36	36	42	1069	30
108Z	.....	5084.1	677	1132	.....	21	27	1069	15
109X	116.20	.....	.....	1133	12	.....	.....	1196	12
109Y	116.25	5084.4	678	1133	36	36	42	1070	30
109Z	.....	5084.7	679	1133	.....	21	27	1070	15
110X	116.30	.....	.....	1134	12	.....	.....	1197	12
110Y	116.35	5085.0	680	1134	36	36	42	1071	30
110Z	.....	5085.3	681	1134	.....	21	27	1071	15
111X	116.40	.....	.....	1135	12	.....	.....	1198	12
111Y	116.45	5086.6	682	1135	36	36	42	1072	30
111Z	.....	5085.9	683	1135	.....	21	27	1072	15
112X	116.50	.....	.....	1136	12	.....	.....	1199	12
112Y	116.55	5086.2	684	1136	36	36	42	1073	30
112Z	.....	5086.5	685	1136	.....	21	27	1073	15
113X	116.60	.....	.....	1137	12	.....	.....	1200	12
113Y	116.65	5086.8	686	1137	36	36	42	1074	30
113Z	.....	5087.1	687	1137	.....	21	27	1074	15
114X	116.70	.....	.....	1138	12	.....	.....	1201	12
114Y	116.75	5087.4	688	1138	36	36	42	1075	30
114Z	.....	5087.7	689	1138	.....	21	27	1075	15
115X	116.80	.....	.....	1139	12	.....	.....	1202	12
115Y	116.85	5088.0	690	1139	36	36	42	1076	30
115Z	.....	5088.3	691	1139	.....	21	27	1076	15
116X	116.90	.....	.....	1140	12	.....	.....	1203	12
116Y	116.95	5088.6	692	1140	36	36	42	1077	30
116Z	.....	5088.9	693	1140	.....	21	27	1077	15
117X	117.00	.....	.....	1141	12	.....	.....	1204	12
117Y	117.05	5089.2	694	1141	36	36	42	1078	30
117Z	.....	5089.5	695	1141	.....	21	27	1078	15

118X	117.10	.....	.....	1142	12	.....	.....	12.5	12
118Y	117.15	5089.8	696	1142	36	36	42	1079	30
118Z	.....	5090.1	697	1142	.....	21	27	1079	12
119X	117.20	.....	.....	1143	12	.....	.....	1206	12
119Y	117.25	5090.4	698	1143	36	36	42	1080	30
119Z	.....	5090.7	699	1143	.....	21	27	1080	15
120X	117.30	.....	.....	1144	12	.....	.....	1207	12
120Y	117.35	.....	.....	1144	36	.....	.....	1081	30
121X	117.40	.....	.....	1145	12	.....	.....	1208	12
121Y	117.45	.....	.....	1145	36	.....	.....	1082	30
122X	117.50	.....	.....	1146	12	.....	.....	1209	12
122Y	117.55	.....	.....	1146	36	.....	.....	1083	30
123X	117.60	.....	.....	1147	12	.....	.....	1210	12
123Y	117.65	.....	.....	1147	36	.....	.....	1084	30
124X	117.70	.....	.....	1148	12	.....	.....	1211	12
** 124Y	117.75	.....	.....	1148	36	.....	.....	1085	30
125X	117.80	.....	.....	1149	12	.....	.....	1212	12
** 125Y	117.85	.....	.....	1149	36	.....	.....	1086	30
126X	117.90	.....	.....	1150	12	.....	.....	1213	12
** 126Y	117.95	.....	.....	1150	36	.....	.....	1087	30

Notes:

* These channels are reserved exclusively for national allotments.

** These channels may be used for national allotment on a secondary basis. The primary reason for reserving these channels is to provide protection for the secondary Surveillance Radar (SSR) system.

▽ 108.0 MHz is not scheduled for assignment to ILS service. The associated DME operating channel No. 17X may be assigned to the emergency service.

(b) *Polarization.* (1) The radio frequency emissions from all ground equipment must be nominally vertically polarized. Any horizontally polarized radio frequency emission component from the ground equipment must not have incorrectly coded angle information such that the limits specified in paragraphs (b) (2) and (3) of this section are exceeded.

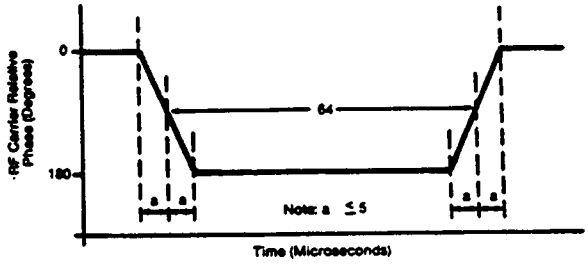
(2) Rotation of the receiving antenna thirty degrees from the vertically polarized position must not cause the path following error to exceed the allowed error at that location.

(c) *Modulation requirements.* Each function transmitter must be capable of DPSK and continuous wave (CW) modulations of the RF carrier which have the following characteristics.

(1) DPSK. The DPSK signal must have the following characteristics:

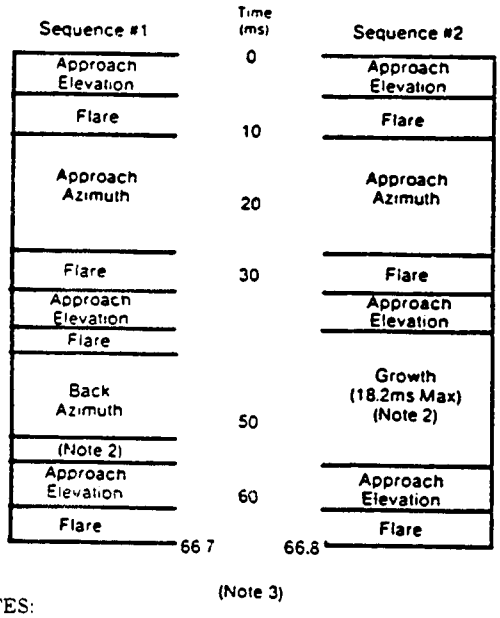
bit rate	15.625 KHz
bit length	64 microseconds
logic "0"	no phase transition
logic "1"	phase transition
phase transition	less than 10 microseconds
phase tolerance	± 10 degrees

The phase shall advance (or retard) monotonically throughout the transition region. Amplitude modulation during the phase transition period shall not be used.



(2) CW. The CW pulse transmissions and the CW angle transmissions as may be required in the signal format of any function must have characteristics such that the requirements of paragraph (d) of this section are met.

(c) *Synchronization.* Synchronization between the azimuth and elevation components is required and, in split-site configurations, would normally be accomplished by landline interconnections. Synchronization monitoring must be provided to preclude function overlap.



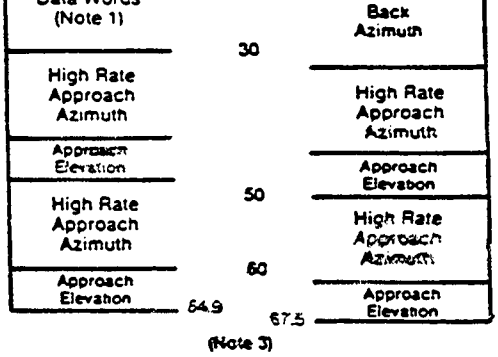
NOTES:
1. When Back Aximuth is Provided. Basic Data Word # 2 Must be Transmitted Only In This Position.
2. Data Words May Be Transmitted In Any Open Time Periods.
3. The Total Time Duration of Sequence # 1 Plus Sequence # 2 Must Not Exceed 134 ms.

FIGURE 2.—Transmission sequence pair which provides for all MLS angle guidance functions.

High Rate Approach Azimuth	[1] 39±1.5
Approach Elevation	39±1.5
Back Azimuth	6.5±0.25
Basic Data	([2])
Auxiliary Data	([3])

[1] The higher rate is recommended for azimuth scanning antennas with beamwidths greater than two degrees. It should be noted that the time available in the signal format for additional functions is limited when the higher rate is used.
[2] Refer to Table 8a.
[3] Refer to Table 8c.

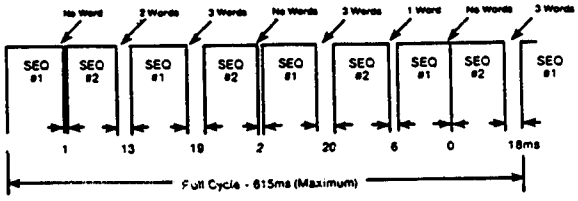
(g) *Transmission sequences.* Sequences of angle transmissions which will generate the required repetition rates are shown in Figures 2 and 3.



Not Exceed 134 ms.

FIGURE 3—Transmission sequence pair which provides for the MLS high rate approach azimuth angle guidance function.

(h) *TDM cycle.* The time periods between angle transmission sequences must be varied so that exact repetitions do not occur within periods of less than 0.5 second in order to protect against synchronous interference. One such combination of sequences is shown in Figure 4 which forms a full multiplex cycle. Data may be transmitted during suitable open times within or between the sequences.



NOTE: Angle sequences are those from Figure 2 or 3. Do not mix sequences.

FIGURE 4—A complete function multiplex cycle.

(i) *Function Formats (General).* Each angle function must contain the following elements: a preamble; sector signals; and a TO and FRO angle scan organized as shown in Figure 5a. Each data function must contain a preamble and a data transmission period organized as shown in Figure 5b.

FIGURE 5—Function format.

FIGURE 6—Preamble organization.

(i) *Digital codes.* The coding used in the preamble for receiver synchronization is a Barker code logic 11101. The time of the last phase transition midpoint in the code shall be the receiver reference time (see Table 2). The function identification codes must be as shown in Table 3. The last two bits (I_{11} and I_{12}) of the code are parity bits obeying the equations:

$I_6+I_7+I_8+I_9+I_{10}+I_{11}$=Even
$I_6+I_8+I_{10}+I_{12}$=Even

(ii) *Data modulation.* The digital code portions of the preamble must be DPSK modulated in accordance with § 171.311(c)(1) and must be transmitted throughout the function coverage volume.

(2) *Angle function formats.* The timing of the angle transmissions must be in accordance with Tables 4a, 4b, and 5. The actual timing of the TO and FRO scans must be as required to meet the accuracy requirements of §§ 171.313 and 171.317.

(i) Preamble. Must be in accordance with requirements of § 171.311(i)(1).

TABLE 2—PREAMBLE TIMING [1]

Event	Event time slot begins at—	
	15.625 kHz clock pulse (number)	Time (milliseconds)
Carrier acquisition:		
(CW transmission)	0	0
Receiver reference time code:		
I_1=1	13	0.832
I_2=1	14	0.896
I_3=1	15	0.960
I_4=0	16	1.024
I_5=1	17	[2] 1.088
Function identification:		
I_6	18	1.152
I_7	19	1.216
I_8	20	1.280
I_9	21	1.344
I_{10} (see table 1)	22	1.408
I_{11}	23	1.472
I_{12}	24	1.536
END PREAMBLE	25	1.600

[1] Applies to all functions transmitted.
[2] Reference time for receiver synchronization for all function timing.

TABLE 3—FUNCTION IDENTIFICATION CODES

Function	Code						
	I_6	I_7	I_8	I_9	I_{10}	I_{11}	I_{12}
Approach azimuth	0	0	1	1	0	0	1
High rate approach azimuth	0	0	1	0	1	0	0
Approach elevation	1	1	0	0	0	0	1
Back azimuth	1	0	0	1	0	0	1
Basic data 1	0	1	0	1	0	0	0
Basic data 2	0	1	1	1	1	0	0
Basic data 3	1	0	1	0	0	0	0
Basic data 4	1	0	0	0	1	0	0
Basic data 5	1	1	0	1	1	0	0
Dasic data 6	0	0	0	1	1	0	1
Auxiliary data A	1	1	1	0	0	1	0
Auxiliary data B	1	0	1	0	1	1	1
Auxiliary data C	1	1	1	1	0	0	0

(ii) *Sector signals.* In all azimuth formats, sector signals must be transmitted to provide Morse Code identification, airborne antenna selection, and system test signals. These signals are not required in the elevation formats. In addition, if the signal from an installed ground

They must be transmitted and repeated at approximately equal intervals, not less than six times per minute, during which time the ground subsystem is available for operational use. When the transmissions of the ground subsystem are not available, the identification signal must be suppressed. The audible tone in the aircraft is started by setting the Morse Code bit to logic "1" and stopped by a logic "0" (see Tables 4a and 4b). The identification code characteristics must conform to the following: the dot must be between 0.13 and 0.16 second in duration, and the dash between 0.39 and 0.48 second. The duration between dots and/or dashes must be one dot plus or minus 10%. The duration between characters (letters) must not be less than three dots. When back azimuth is provided, the code shall be transmitted by the approach azimuth and back azimuth within plus or minus 0.08 seconds.

(B) *Airborne antenna selection.* A signal for airborne antenna selection shall be transmitted as a "zero" DPSK signal lasting for a six-bit period (see Tables 4a and 4b).

TABLE 4a—APPROACH AZIMUTH FUNCTION TIMING

Event	Event time slot begins at—	
	15.625 kHz clock pulse (number)	Time (milliseconds)
Preamble	0	0
Morse code	25	1.600
Antenna select	26	1.664
Rear OCI	32	2.048
Left OCI	34	2.176
Right OCI	36	2.304
To test	38	2.432
To scan [1]	40	2.560
Pause	.....	8.760
Midscan point	.....	9.060
FRO scan [1]	.....	9.360
FRO test	.....	15.560
End Function (Airborne)	.....	15.688
End guard time; end function (ground)	.....	15.900

[1] The actual commencement and completion of the TO and the FRO scan transmissions are dependent on the amount of proportional guidance provided. The time slots provided shall accommodate a maximum scan of plus or minus 62.0 degrees. Scan timing shall be compatible with accuracy requirements.

TABLE 4b—HIGH RATE APPROACH AZIMUTH AND BACK AZIMUTH FUNCTION TIMING

Event	Event time slot begins at—	
	15.625 kHz clock pulse (number)	Time (milliseconds)
Preamble	0	0
Morse Code	25	1.600
Antenna select	26	1.664
Rear OCI	32	2.048
Left OCI	34	2.176
Right OCI	36	2.304
To test	38	2.432
To scan [1]	40	2.560
Pause	.....	6.760
Midscan point	.....	7.060
FRO scan [1]	.....	7.360
FRO test pulse	.....	11.560
End function (airborne)	.....	11.688
End guard time; end function (ground)	.....	11.900

[1] The actual commencement and completion of the TO and the FRO scan transmissions are dependent on the amount of proportional guidance provided. The time slots provided will accommodate a maximum scan of plus or minus 42.0 degrees. Scan timing shall be compatible with accuracy requirements.

(C) *OCI.* Where OCI pulses are used, they must be: (1) greater than any guidance signal in the OCI sector; (2) at least 5 dB less than the level of the scanning beam within the proportional guidance sector; and (3) for azimuth functions with clearance signals, at least 5 dB less than the level of the left (right) clearance pulses within the left (right) clearance sector.

Preamble	0	0
Processor pause	25	1.600
OCI	27	1.728
To scan [1]	29	1.856
Pause	.....	3.406
Midscan point	.....	3.606
FRO scan [1]	.....	3.806
End function (airborne)	.....	5.356
End guard time; end function (ground)	.....	5.600

[1] The actual commencement and completion of the TO and FRO scan transmissions are dependent upon the amount of proportional guidance provided. The time slots provided will accommodate a maximum scan of −1.5 degrees to +29.5 degrees. Scan timing shall be compatible with accuracy requirements.

The duration of each pulse measured at the half amplitude point shall be at least 100 microseconds, and the rise and fall times shall be less then 10 microseconds. It shall be permissible to sequentially transmit two pulses in each out-of-coverage indication time slot. Where pulse pairs are used, the duration of each pulse shall be at least 50 microseconds, and the rise and fall times shall be less then 10 microseconds. The transmission of out-of-coverage indication pulses radiated from antennas with overlapping coverage patterns shall be separated by at least 10 microseconds.

NOTE: If desired, two pulses may be sequentially transmitted in each OCI time slot. Where pulse pairs are used, the duration of each pulse must be 45 (±5) as follows:

(A) *General.* Azimuth and elevation angles are encoded by scanning a narrow beam between the limits of the proportional coverage sector first in one direction (the TO scan) and then in the opposite direction (the FRO scan). Angular information must be encoded by the amount of time separation between the beam centers of the TO and FRO scanning beam pulses. The TO and FRO transmissions must be symmetrically disposed about the midscan point listed in Tables 4a, 4b, 5, and 7. The midscan point and the center of the time interval between the TO and FRO scan transmissions must coincide with a tolerance of ±10 microseconds. Angular coding must be linear with angle and properly decoded using the formula:

$$\theta = \frac{V}{2} (T_0 - t)$$

where:

θ=Receiver angle in degrees.

V=Scan velocity in degrees per microsecond.

T_0=Time separation in microseconds between TO and FRO beam centers corresponding to zero degrees.

t=Time separation in microseconds between TO and FRO beam centers.

The timing requirements are listed in Table 6 and illustrated in Figure 7.

SIGNAL FORMAT
TIME SLOTS:

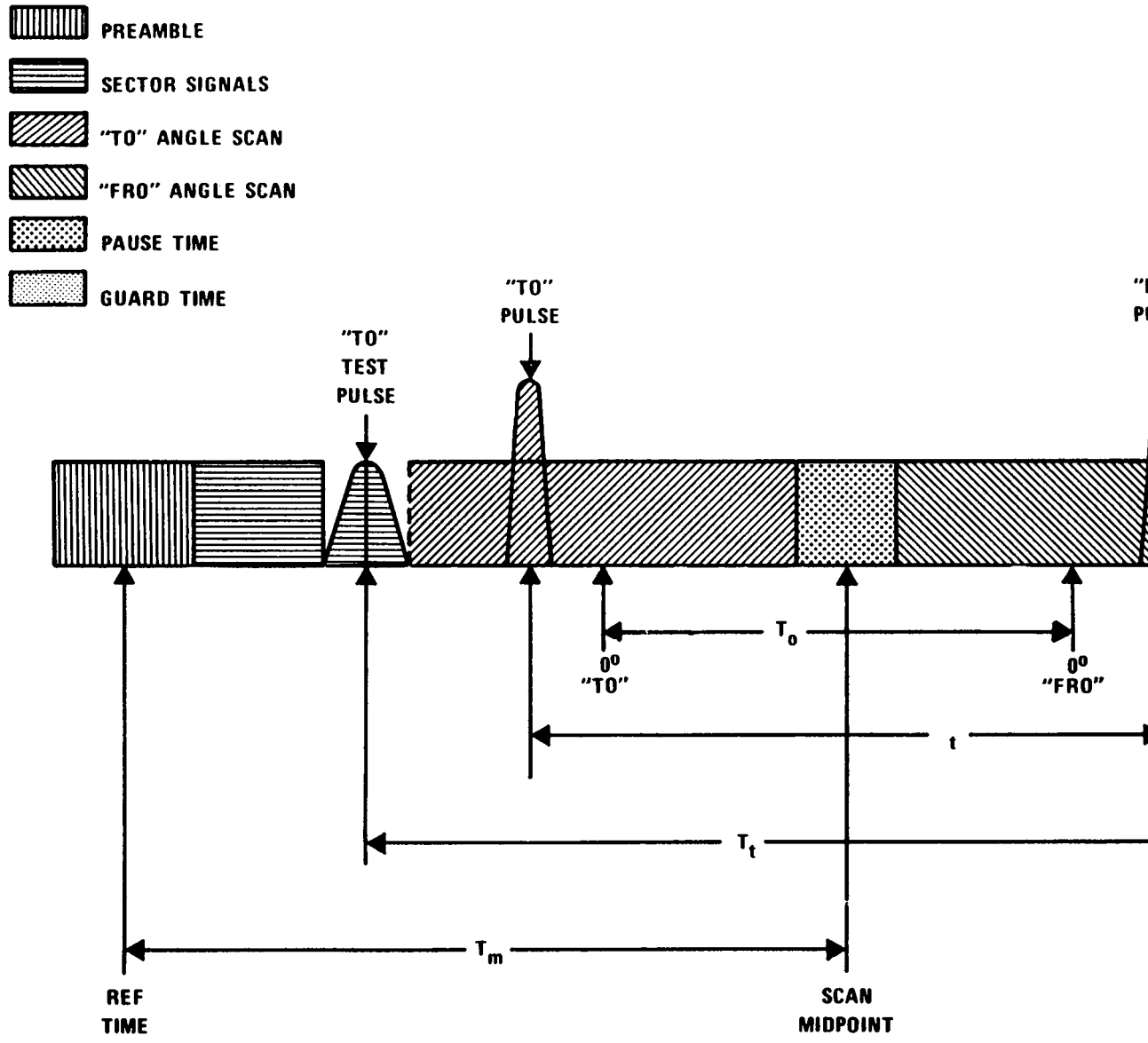


FIGURE 7—Azimuth angle scan timing (not to scale)

and a broad beam in the orthogonal plane which fills the vertical coverage.

(C) *Elevation angle encoding.* The radiation from elevation equipment must produce a beam which scans from the horizon up to the highest elevation angle and then scans back down to the horizon. The antenna has a narrow beam in the plane of the scan direction and a broad beam in the orthogonal plane which fills the horizontal coverage. Elevation angles are defined from the horizontal plane containing the antenna phase center; positive angles are above the horizontal and zero angle is along the horizontal.

(iv) *Clearance guidance.* The timing of the clearance pulses must be in accordance with Figure 8. For azimuth elements with proportional coverage of less than ±40 degrees (±20 degrees for back azimuth), clearance guidance information must be provided by transmitting pulses in a TO and FRO format adjacent to the stop/start times of the scanning beam signal. The fly-right clearance pulses must represent positive angles and the fly-left clearance pulses must represent negative angles. The duration of each clearance pulse must be 50 microseconds with a tolerance of ±5 microseconds. The transmitter switching time between the clearance pulses and the scanning beam transmissions must not exceed 10 microseconds. The rise time at the edge of each clearance pulse must be less than 10 microseconds. Within the fly-right clearance signals shall be at least 5dB below the proportional guidance signal. Optionally, clearance guidance may be provided by scanning throughout the approach guidance sector. For angles outside the approach azimuth proportional coverage limits as set in Basic Data Word One (Basic Data Word 5 for back azimuth), proper decode and display of clearance guidance must occur to the limits of the guidance region. Where used, clearance pulses shall be transmitted adjacent to the scanning beam signals at the edges of proportional coverage as shown in Figure 8. The proportional coverage boundary shall be established at one beamwidth inside the scan start/stop angles, such that the transition between scanning beam and clearance signals occurs outside the proportional coverage sector. When clearance pulses are provided in conjunction with a narrow beamwidth (e.g., one degree) scanning antenna, the scanning beam antenna shall radiate for 15 microseconds while stationary at the scan start/stop angles.

(3) *Data function format.* Basic data words provide equipment characteristics and certain siting information. Basic data words must be transmitted from an antenna located at the approach azimuth or back azimuth site which provides coverage throughout the appropriate sector. Data function timing must be in accordance with Table 7a.

TABLE 6—ANGLE SCAN TIMING CONSTANTS

Function	Max value of $_t$(usec)	T_o (usec)	V(deg/usec)	T_m (usec)	Pause time (usec)	T_t (usec)
Approach azimuth	13,000	6,800	0.02	7,972	600	13,128
High rate approach azimuth	9,000	4,800	0.02	5,972	600	9,128
Approach elevation	3,500	3,350	0.02	2,518	400	N/A
Back azimuth	9,000	4,800	−0.02	5,972	600	9,128

Preamble	0	0
Data transmission (bits I_{13}–I_{30})	25	1.600
Parity transmission (bits I_{31}–I_{32})	43	2.752
End function (airborne)	45	2.880
End guard time: end function (ground)	.....	3.100

[1] The previous event time slot ends at this time.

TABLE 7b—AUXILIARY DATA FUNCTION TIMING—(DIGITAL)

Event	Event time slot begins at:	
	15.625 kHz clock pulse (number)	Time (milliseconds)
Preamble	0	0
Address transmission (bits I_{13}–I_{20})	25	1.600
Data transmission: (bits I_{21}–I_{69})	33	2.112
Parity transmission (bits I_{70}–I_{76})	82	5.248
End function (airborne)	89	5.696
End guard time; end function (ground)	.....	5.900

TABLE 7c—AUXILIARY DATA FUNCTION TIMING—(ALPHANUMERIC)

Event	Event time slot begins at:	
	15.615 kHz clock pulse (number)	Time (milliseconds)
Preamble	0	0
Address transmission (bits I_{13}–I_{20})	25	1.600
Data transmission: (bits I_{21}–I_{76}	33	2.112
End function (airborne)	89	5.696
End guard time; (end function ground)	.....	5.900

(i) *Preamble.* Must be in accordance with requirements of § 171.311(i)(1).

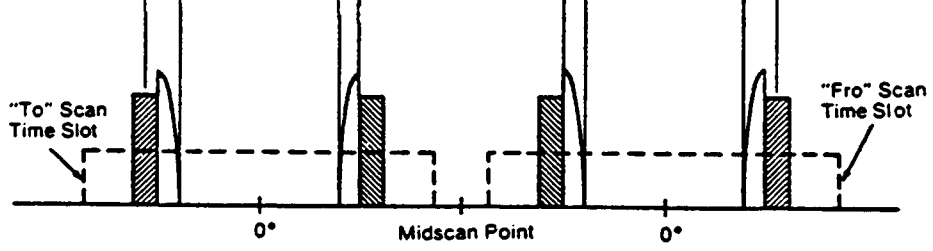
(ii) *Data transmissions.* Basic data must be transmitted using DPSK modulation. The content and repetition rate of each basic data word must be in accordance with Table 8a. For data containing digital information, binary number 1 must represent the lower range limit with increments in binary steps to the upper range limit shown in Table 8a. Data containing digital information shall be transmitted with the least significant bit first.

(j) *Basic Data word requirements.* Basic Data shall consist of the items specified in Table 8a. Basic Data word contents shall be defined as follows:

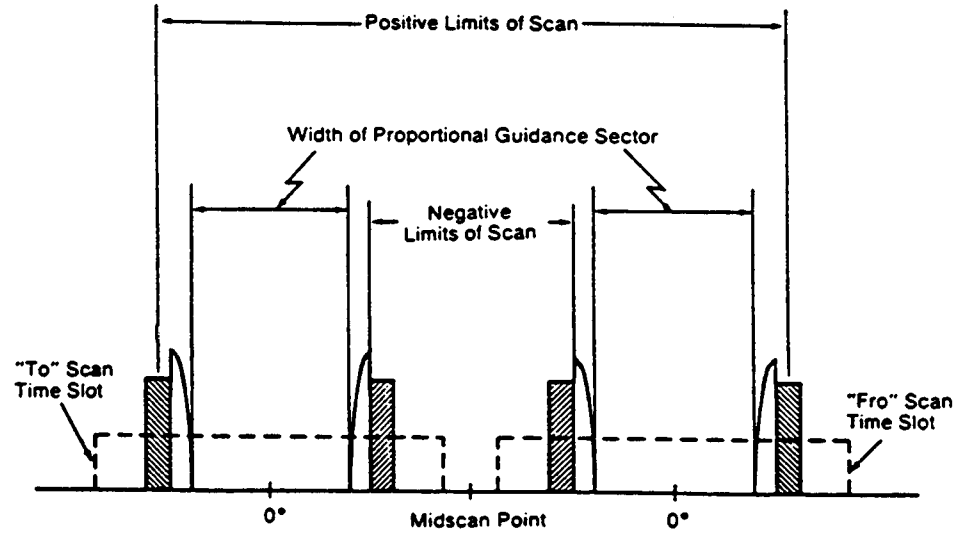
(1) *Approach azimuth to threshold distance* shall represent the minimum distance between the Approach Azimuth antenna phase center and the vertical plane perpendicular to the centerline which contains the landing threshold.

(2) *Approach azimuth proportional coverage limit* shall represent the limit of the sector in which proportional approach azimuth guidance is transmitted.

(3) *Clearance signal type* shall represent the type of clearance when used. Pulse clearance is that which is in accordance with § 171.311 (i) (2) (iv). Scanning Beam (SB) clearance indicates that the proportional guidance sector is limited by the proportional coverage limits set in basic data.



(a) APPROACH AZIMUTH



(b) BACK AZIMUTH

Legend

Clearance Pulses		Scanning Beam Pulses	
	Fly-Left		Start Scan
	Fly-Right		Stop Scan

FIGURE 8—Clearance pulse timing for azimuth functions.

3	.....	.....	1
4	.....	.....	0
5	.....	.....	1
6	.....	.....	0
7	.....	.....	1
8	.....	.....	0
9	.....	.....	1
10	.....	.....	0
11	.....	.....	0
12	.....	.....	0
13	Approach azimuth to threshold distance (Om–630m).	100m	100m
14	.....	.....	200m
15	.....	.....	400m
16	.....	.....	800m
17	.....	.....	1600m
18	.....	.....	3200m
19	Approach azimuth proportional coverage limit (negative limit) (0° to –62°).	2°	–2°
20	.....	.....	–4°
21	.....	.....	–8°
22	.....	.....	–16°
23	.....	.....	–32°
24	Approach azimuth proportional coverage limit (positive limit) (0° to +62°).	2°	2°
25	.....	.....	4°
26	.....	.....	8°
27	.....	.....	16°
28	.....	.....	32°
29	Clearance signal type	N/A	0=pulse; 1=SB
30	Spare	.....	Transmit zero
31	Parity: (13+14+15. . .+30 +31=odd).	N/A	N/A
32	Parity: (14+16+18. . .+30 +32=odd).	N/A	N/A

Note 1: Transmit throughout the Approach Azimuth guidance sector at intervals of 1.0 seconds or less.

Note 2: The all zero state of the data field represents the lower limit of the absolute value of the coded parameter unless otherwise noted.

3	.....	.....	1
4	.....	.....	0
5	.....	.....	1
6	.....	.....	0
7	.....	.....	1
8	.....	.....	1
9	.....	.....	1
10	.....	.....	1
11	.....	.....	0
12	.....	.....	0
13	Minimum glide path (2.0° to 14.7°).	0.1°	0.1°
14	.....	.....	0.2°
15	.....	.....	0.4°
16	.....	.....	0.8°
17	.....	.....	1.6°
18	.....	.....	3.2°
19	.....	.....	6.4°
20	Back azimuth status	.....	see note 4
21	DME status	.....	see note 6
22	.....	.....	
23	Approach azimuth status ...	.....	see note 4
24	Approach azimuth status ...	.....	see lnote 4
25	Spare	.....	Transmit zero
26	.....do	.....	Do.
27	.....do	.....	Do.
28	.....do	.....	Do.
29	.....do	.....	Do.
30	.....do	.....	Do.
31	Parity: (13+14+15. . .+30 +31)=odd).	N/A	N/A
32	Parity: (14+16+18. . .+30 +32=odd).	N/A	N/A

Note 1: Transmit throughout the Approach Azimuth guidance sector at intervals of 0.16 seconds or less.

Note 2: The all zero state of the data field represents the lower limit of the absolute range of the coded parameter unless otherwise noted.

3	.....	.....	1
4	.....	.....	0
5	.....	.....	1
6	.....	.....	1
7	.....	.....	0
8	.....	.....	1
9	.....	.....	0
10	.....	.....	0
11	.....	.....	0
12	.....	.....	0
13	Approach azimuth beam-width (0.5°–4.0°) See note 7.	0.5°	0.5°
14	.....	.....	1.0°
15	.....	.....	2.0°
16	Approach elevation beam-width (0.5° to 2.5°) See note 7.	0.5°	0.5°
17	.....	.....	1.0°
18	Note: values greater than 2.5° are invalid.	.....	2.0°
19	DME distance (Om to 6387.5m.	12.5m	12.5m
20	.....	.....	25.0m
21	.....	.....	50.0m
22	.....	.....	100.0m
23	.....	.....	200.0m
24	.....	.....	400.0m
25	.....	.....	800.0m
26	.....	.....	1600.0m
27	.....	.....	3200.0m
28	Spare	.....	Transmit zero
29	.....do	.....	Do.
30	.....do	.....	Do.
31	Parity: (13+14+15. . .+30 +31=odd).	.....	
32	Parity: (14+16+18. . .+30 +32=odd).	N/A	N/A

Note 1: Transmit throughout the Approach Azimuth guidance sector at intervals of 1.0 seconds or less.

Note 2: The all zero state of the data field represents the lower limit of the absolute range of the coded parameter unless otherwise noted.

3	.....	.....	1
4	.....	.....	0
5	.....	.....	1
6	.....	.....	1
7	.....	.....	0
8	.....	.....	0
9	.....	.....	0
10	.....	.....	1
11	.....	.....	0
12	.....	.....	0
13	Approach azimuth magnetic orientation (0° to 359°).	1°	1°
14	.....	.....	2°
15	.....	.....	4°
16	.....	.....	8°
17	.....	.....	16°
18	.....	.....	32°
19	.....	.....	64°
20	.....	.....	128°
21	.....	.....	256°
22	Back azimuth magnetic orientation (0° to 359°).	1°	1°
23	.....	.....	2°
24	.....	.....	4°
25	.....	.....	8°
26	.....	.....	16°
27	.....	.....	32°
28	.....	.....	64°
29	.....	.....	128°
30	.....	.....	256°
31	Parity: (13+14+15. . .+30 +31=odd).	N/A	N/A
32	Parity: (14+16+18. . .+30 +32=odd).	N/A	N/A

Note 1: Transmit at intervals of 1.0 second or less throughout the Approach Azimuth guidance sector, except when Back Azimuth guidance is provided. See Note 8.

Note 2: The all zero state of the data field represents the lower limit of the absolute range of the coded parameter unless otherwise noted.

3	.....	.....	1
4	.....	.....	0
5	.....	.....	1
6	.....	.....	1
7	.....	.....	1
8	.....	.....	0
9	.....	.....	1
10	.....	.....	1
11	.....	.....	0
12	.....	.....	0
13	Back azimuth proportional coverage negative limit (0° to –42°).	2°	–2°
14	.....	.....	–4°
15	.....	.....	–8°
16	.....	.....	–16°
17	.....	.....	–32°
18	Back azimuth proportional coverage positive limit (0° to +42°).	2°	2°
19	.....	.....	4°
20	.....	.....	8°
21	.....	.....	16°
22	.....	.....	32°
23	Back azimuth beamwidth (0.5° to 4.0°) See note 7.	0.5°	0.5°
24	.....	.....	1.0°
25	.....	.....	2.0°
26	Back azimuth status	.....	See Note 10
27	.....do	.....	Do.
28	.....do	.....	Do.
29	.....do	.....	Do.
30	.....do	.....	Do.
31	Parity: (13+14+15. . .+30 +31=odd).	N/A	N/A
32	Parity: (14+16+18. . .+30 +32=odd).	N/A	N/A

Note 1: Transmit only when Back Azimuth guidance is provided. See note 9.

Note 2: The all zero state of the data filed represents the lower limit of the absolute range of the coded parameter unless otherwise noted.

3	.....	.....	1
4	.....	.....	0
5	.....	.....	1
6	.....	.....	0
7	.....	.....	0
8	.....	.....	0
9	.....	.....	1
10	.....	.....	1
11	.....	.....	0
12	.....	.....	1
(13–30)	MLS ground equipment identification (Note 3).	.....	
13	Character 2	N/A	B1
14	.....	.....	B2
15	.....	.....	B3
16	.....	.....	B4
17	.....	.....	B5
18	.....	.....	B6
19	Character 3	N/A	B1
20	.....	.....	B2
21	.....	.....	B3
22	.....	.....	B4
23	.....	.....	B5
24	.....	.....	B6
25	Character 4	N/A	B1
26	.....	.....	B2
27	.....	.....	B3
28	.....	.....	B4
29	.....	.....	B5
30	.....	.....	B6
31	Parity: (13+14+15. . .+30 +31=odd).	N/A	N/A
32	Parity: (14+16+18. . .+30 +32=odd).	N/A	N/A

Note 1: Transmit at intervals of 1.0 second or less throughout the Approach Azimuth guidance sector, except when Back Azimuth guidance is provided. See note 8.

1=Function radiated in normal mode (for Back Azimuth, this also indicates that a Back Azimuth transmission follows).

Note 5: Date items which are not applicable to a particular ground equipment shall be transmitted as all zeros.

Note 6: Coding for status bits:

I_{21}	I_{22}	
0	0	DME transponder inoperative or not available.
1	0	Only IA mode or DME/N available.
0	0	FA mode, Standard 1, available.
1	1	FA mode, Standard 2, available.
2		

Note 7: The value coded shall be the actual beamwidth (as defined in § 171.311 (j)(9) rounded to the nearest 0.5 degree.

Note 8: When back Azimuth guidance is provided, Data Words 4 and 6 shall be transmitted at intervals of 1.33 seconds or less throughout the Approach Azimuth coverage and 4 seconds or less throughout the Back Azimuth coverage.

Note 9: When Back Azimuth guidance is provided, Data Word 5 shall be transmitted at an interval of 1.33 seconds or less through out the Back Azimuth coverage sector and 4 seconds or less throughout the Approach Azimuth coverage sector.

Note 10: Coding for status bit:
0=Function not radiated, or radiated in test mode (not reliable for navigation).
1=Function radiated in normal mode.

(4) *Minimum glidepath* the lowest angle of descent along the zero degree azimuth that is consistent with published approach procedures and obstacle clearance criteria.

(5) *Back azimuth status* shall represent the operational status of the Back Azimuth equipment.

(6) *DME status* shall represent the operational status of the DME equipment.

(7) *Approach azimuth status* shall represent the operational status of the approach azimuth equipment.

(8) *Approach elevation status* shall represent the operational status of the approach elevation equipment.

(9) *Beamwidth* the width of the scanning beam main lobe measured at the -3 dB points and defined in angular units on the antenna boresight, in the horizontal plane for the azimuth function and in the vertical plane for the elevation function.

(10) *DME distance* shall represent the minimum distance between the DME antenna phase center and the vertical plane perpendicular to the runway centerline which contains the MLS datum point.

NOTE: For example, this data item would be encoded 270 for a Back Azimuth Antenna serving runway 27 (assuming the magnetic heading is 270 degrees) when sited such that the zero degree radial is parallel to centerline.

(12) *Back azimuth magnetic orientation* shall represent the angle measured in the horizontal plane clockwise from Magnetic North to the zero-degree angle guidance radial originating from the Back Azimuth antenna. The vertex of the measured angle shall be at the Back Azimuth antenna phase center.

NOTE: For example, this data item would be encoded 270 for a Back Azimuth Antenna serving runway 27 (assuming the magnetic heading is 270 degrees) when sited such that the zero degree radial is parallel to centerline.

(13) *Back azimuth proportional coverage limit* shall represent the limit of the sector in which proportional back azimuth guidance is transmitted.

(14) *MLS ground equipment identification* shall represent the last three characters of the system identification specified in § 171.311(i)(2). The characters shall be encoded in accordance with International Alphabet No. 5 (IA–5) using bits b_1 through b_6.

NOTE: Bit b_7 of this code may be reconstructed in the airborne receiver by taking the complement of bit b_6.

(k) *Residual radiation.* The residual radiation of a transmitter associated with an MLS function during time intervals when it should not be transmitting shall not adversely affect the reception of any other function. The residual radiation of an MLS function at times when another function is radiating shall be at least 70 dB below the level provided when transmitting.

(l) *Symmetrical scanning.* The TO and FRO scan transmissions shall be symmetrically disposed about the mid-scan point listed in Tables 4a, 4b and 5. The mid-scan point and the center of the time interval between the TO and FRO scan shall coincide with a tolerance of plus or minus 10 microseconds.

(m) *Auxiliary data*—(1) *Addresses.* Three function identification codes are reserved to indicate transmission of Auxiliary Data A, Auxiliary Data B, and Auxiliary Data C. Auxiliary Data A contents are specified below, Auxiliary Data B contents are reserved for future use, and Auxiliary Data C contents are reserved for national use. The address

National Standard Code for Information Interchange (ASCII). An even parity bit is added to each character. Alphanumeric data must be transmitted in the order in which they are to be read. The serial transmission of a character must be with the lower order bit transmitted first and the parity bit transmitted last. The timing for alphanumeric auxiliary data must be as shown in Table 7c.

(3) *Auxiliary Data A content:* The data items specified in Table 8c are defined as follows:

(i) *Approach azimuth antenna offset* shall represent the minimum distance between the Approach Azimuth antenna phase center and the vertical plane containing the runway centerline.

(ii) *Approach azimuth to MLS datum point distance* shall represent the minimum distance between the Approach Azimuth antenna phase center and the vertical plane perpendicular to the centerline which contains the MLS datum point.

(iii) *Approach azimuth alignment with runway centerline* shall represent the minimum angle between the approach azimuth antenna zero-degree guidance plane and the runway certerline.

(iv) *Approach azimuth antenna coordinate system* shall represent the coordinate system (planar or conical) of the angle data transmitted by the approach azimuth antenna.

(v) *Approach elevation antenna offset* shall represent the minimum distance between the elevation antenna phase center and the vertical plane containing the runway centerline.

(vi) *MLS datum point to threshold distance* shall represent the distance measured along the runway centerline from the MLS datum point to the runway threshold.

(vii) *Approach elevation antenna height* shall represent the height of the elevation antenna phase center relative to the height of the MLS datum point.

(viii) *DME offset* shall represent the minimum distance between the DME antenna phase azimuth antenna phase center and the vertical plane containing the runway centerline.

(xi) *Back azimuth to MLS datum point distance* shall represent the minimum distance between the Back Azimuth antenna and the vertical plane perpendicular to the centerline which contains the MLS datum point.

(xii) *Back azimuth antenna alignment with runway centerline* shall represent the minimum angle between the back azimuth antenna zero-degree guidance plane and the runway centerline.

(Admt. 171–311, Eff. 5/18/84)

§ 171.313 Azimuth performance requirements.

This section prescribes the performance requirements for the azimuth equipment of the MLS as follows:

(a) *Approach azimuth coverage requirements.* The approach azimuth equipment must provide guidance information in at least the following volume of space (see Figure 9):

TABLE 8b—AUXILIARY DATA WORD ADDRESS CODES

No.	I_{13}	I_{14}	I_{15}	I_{16}	I_{17}	I_{18}	I_{19}	I_{20}
1.	0	0	0	0	0	1	1	1
2.	0	0	0	0	1	0	1	0
3.	0	0	0	0	1	1	0	1
4.	0	0	0	1	0	0	1	1
5.	0	0	0	1	0	1	0	0
6.	0	0	0	1	1	0	0	1
7.	0	0	0	1	1	1	1	0
8.	0	0	1	0	0	0	1	0
9.	0	0	1	0	0	1	0	1
10.	0	0	1	0	1	0	0	0
11.	0	0	1	0	1	1	1	1
12.	0	0	1	1	0	0	0	1
13.	0	0	1	1	0	1	1	0
14.	0	0	1	1	1	0	1	1
15.	0	0	1	1	1	1	0	0
16.	0	1	0	0	0	0	1	1
17.	0	1	0	0	0	1	0	0
18.	0	1	0	0	1	0	0	1
19.	0	1	0	0	1	1	1	0

24.	0	1	1	0	0	0	0	1
25.	0	1	1	0	0	1	1	0
26.	0	1	1	0	1	0	1	1
27.	0	1	1	0	1	1	0	0
28.	0	1	1	1	0	0	1	0
29.	0	1	1	1	0	1	0	1
30.	0	1	1	1	1	0	0	0
31.	0	1	1	1	1	1	1	1
32.	1	0	0	0	0	0	1	0
33.	1	0	0	0	0	1	0	1
34.	1	0	0	0	1	0	0	0
35.	1	0	0	0	1	1	1	1
36.	1	0	0	1	0	0	0	1
37.	1	0	0	1	0	1	1	0
38.	1	0	0	1	1	0	1	1
39.	1	0	0	1	1	1	0	0
40.	1	0	1	0	0	0	0	0
41.	1	0	1	0	0	1	1	1
42.	1	0	1	0	1	0	1	0
43.	1	0	1	0	1	1	0	1
44.	1	0	1	1	0	0	1	1
49.	1	1	0	0	0	1	1	0
50.	1	1	0	0	1	0	1	1
51.	1	1	0	0	1	1	0	0
52.	1	1	0	1	0	0	1	0
53.	1	1	0	1	0	1	0	1
54.	1	1	0	1	1	0	0	0
55.	1	1	0	1	1	1	1	1
56.	1	1	1	0	0	0	1	1
57.	1	1	1	0	0	1	0	0
58.	1	1	1	0	1	0	0	1
59.	1	1	1	0	1	1	1	0
60.	1	1	1	1	0	0	0	0
61.	1	1	1	1	0	1	1	1
62.	1	1	1	1	1	0	1	0
63.	1	1	1	1	1	1	0	1
64.	0	0	0	0	0	0	0	0

NOTE 1: Parity bits I_{19} and I_{20} are chosen to satisfy the equations:

$I_{13}+I_{14}+I_{15}+I_{16}+I_{17}+I_{18}+I_{19}$=EVEN
$I_{14}+I_{16}+I_{18}+I_{20}$=EVEN

TABLE 8c—AUXILIARY DATA

Word (See note 6)	Data content	Type of data	Maximun time between transmissions (Seconds)	Bits used	Range of values	Least significant bit
A1	Preamble	Digital	1.0	12		
	Address			8		
	Approach azimuth antenna offset.			10	−511 m to +511 m (See note 3)	1 m
	Approach azimuth to MLS datum point distance.			13	0 m to 8 191 m	1 m
	Approach azimuth antenna alignment with runway centerline.			12	−20.47° to 20.47° (See note 3)	0.01°
	Approach azimuth antenna coordinate system.			1	(See note 2)	
	Spare			13		
	Parity			7	(See note 1)	
A2	Preamble	Digital	1.0	12		
	Address			8		
	Approach elevation antenna offset.			10	−511 m to +511 m (See note 3)	1 m
	MLS datum point to threshold distance.			10	0 m to 1 023 m	1 m
	Approach elevation antenna height.			7	−6.3 m to +6.3 m (See note 3)	0.1 m

is less than plus or minus 40 degrees. When intervening obstacles prevent full coverage, the ±40° guidance sector can be reduced as required. For systems providing ±60° lateral guidance the coverage requirement is reduced to 14 nm beyond ±40°.

(2) Vertically between:

(i) A conical surface originating 2.5 meters (8 feet) above the runway centerline at threshold inclined at 0.9 degree above the horizontal.

(ii) A conical surface originating at the azimuth ground equipment antenna inclined at 15 degrees above the horizontal to a height of 6000 meters (20,000 feet).

(iii) Where intervening obstacles penetrate the lower surface, coverage need be provided only to the minimum line of sight.

which is 2.5 meters (8 feet) above the farthest point of runway centerline which is in line of sight of the azimuth antenna, and in a conical surface originating at the azimuth ground equipment antenna inclined at 20 degrees above the horizontal up to a height to 600 meters (2000 feet). This requirement does not apply to offset azimuth installations.

(4) Within the approach azimuth coverage sector defined in paragraphs (a) (1), and (2) and (3) of this section, the power densities must not be less than those shown in Table 9 but the equipment design must also allow for:

(i) Transmitter power degradation from normal by 1.5 dB;

TABLE 9—MINIMUM POWER DENSITY WITHIN COVERAGE BOUNDARIES (dBW/m^2)

Function	Data signals	Angle signals for various antenna beamwidths				Clearance signals
		1°	1.5°	2°	3°	
Approach azimuth	-89.5	-88	.....	-85.5	-82	-88
High rate approach azimuth	-89.5	-88	.....	-88	-86.5	-88
Back azimuth	-89.5	-88	.....	-85.5	-82	-88
Approach elevation	-89.5	-88	-88	-88	.....	.....

(ii) Rain loss of —2.2 dB at the longitudinal coverage extremes.

(b) *Siting requirements.* The approach azimuth antenna system must, except as allowed in paragraph (c) of this section:

(1) Be located on the extension of the centerline of the runway beyond the stop end;

(2) Be adjusted so that the zero degree azimuth plane will be a vertical plane which contains the centerline of the runway served;

(3) Have the minimum height necessary to comply with the coverage requirements prescribed in paragraph (a) of this section;

(4) Be located at a distance from the stop end of the runway that is consistent with safe obstruction clearance practices;

(5) Not obscure any light of an approach lighting system; and

(6) Be installed on frangible mounts or beyond the 300 meter (1000 feet) light bar.

(c) On runways where limited terrain prevents the azimuth antenna from being positioned on the runway centerline extended, and the cost of the land fill or a tall tower antenna support is prohibitive, the azimuth antenna may be offset.

(d) *Antenna coordinates.* The scanning beams transmitted by the approach azimuth equipment

From the approach reference datum to the coverage limit, the PFE, PFN and CMN limits, expressed in angular terms, shall be allowed to linearly increase as follows:

(i) With distance along the runway centerline extended, by a factor of 1.2 for the PFE and PFN limits and to ±0.10 degree for the CMN limits.

(ii) With azimuth angle, by a factor of 1.5 at the ±40 degree and a factor of 2.0 at the ±60 degree azimuth angles for the PFE, PFN and CMN limits.

(iii) With elevation angle from +9 degrees to +15 degrees, by a factor of 1.5 for the PFE and PFN limits.

(iv) Maximum angular limits. The PFE limits shall not exceed ±0.25 degree in any coverage region below an elevation angle of +9 degrees nor exceed ±0.50 degree in any coverage region above that elevation angle. The CMN limits shall not exceed ±0.10 degree in any coverage region within ±10 degrees of runway centerline extended nor exceed ±0.20 degree in any other region within coverage.

NOTE: It is desirable that the CMN not exceed ±0.10 degree throughout the coverage.

(f) Approach azimuth antenna characteristics are as follows:

(1) *Drift.* Any azimuth angle as encoded by the scanning beam at any point within the proportional coverage must not vary more than ±0.07 degree over the range of service conditions specified in § 171.309(d) without the use of internal environmental controls. Multipath effects are excluded from this requirement.

(2) *Beam pointing errors.* The azimuth angle as encoded by the scanning beam at any point within ±0.5 degree of the zero degree azimuth must not deviate from the true azimuth angle at that point by more than ±0.5 degree. Multipath and drift effects are excluded from this requirement.

CMN	±10.5 ft. (3.2m) [1,4]	±0.030° .	±0.050°

Notes:

[1] Includes errors due to ground and airborne equipment and propagation effects.

[2] The system PFN component must not exceed ±3.5 meters (11.5 feet).

[3] The mean (bias) error component contributed by the ground equipment should not exceed ±10 feet.

[4] The system control motion noise must not exceed 0.1 degree.

[5] The airborne subsystem angular errors are provided for information only.

(3) *Antenna alignment.* The antenna must be equipped with suitable optical, electrical or mechanical means or any combination of the three, to bring the zero degree azimuth radial into coincidence with the approach reference datum (for centerline siting) with a maximum error of 0.02 degree. Additionally, the azimuth antenna bias adjustment must be electronically steerable at least to the monitor limits in steps not greater than 0.005 degree.

(4) *Antenna far field patterns in the plane of scan.* On boresight, the azimuth antenna mainlobe pattern must conform to Figure 10, and the beamwidth must be such that, in the installed environment, no significant lateral reflections of the mainlobe exist along the approach course. In any case the beamwidth must not exceed three degrees. Anywhere within coverage the -3 dB width of the antenna mainlobe, while scanning normally, must not be less than 25 microseconds (0.5 degree) or greater than 250 microseconds (5 degrees). The antenna mainlobe may be allowed to broaden from the value at boresight by a factor of $1/\cos\theta$, where θ is the angle off boresight. The sidelobe levels must be as follows:

(i) *Dynamic sidelobe levels.* With the antenna scanning normally, the dynamic sidelobe level that is detected by a receiver at any point within the proportional coverage sector must be down at least 10 dB from the peak of the main beam. Outside the coverage sector, the radiation from the the scanning beam antenna must be of such a nature that receiver warning will not be removed or suitable OCI signals must be provided.

	Address	.....	.....	8	.....	.....
	DME offset	.....	.....	10	−511 m to +511 m	1 m
	DME to MLS datum point distance.	.....	.....	14	−8 191 m to +8 191 m (See note 3).	1 m
	Spare	.....	.....	25	.....	.....
	Parity	.....	.....	7	(See note 1)	.....
A4	Preamble	Digital	(See note 5)	12	.....	.....
	Address	.....	.....	8	.....	.....
	Back azimuth antenna	.....	.....	10	−511 m to +511 m (See note 3) ..	1 m
	Back azimuth to MLS datum point distance.	.....	.....	11	0 m to 2 047 m	1 m
	Back azimuth antenna alignment with runway centerline.	.....	.....	12	−20.47° to 20.47° (See note 3)	0.01°
	Spare	.....	.....	16	.....	.....
	Parity	.....	.....	7	(See note 1)	.....

[1] Note 1: Parity bits I_{70} to I_{76} are chosen to satisfy the equations which follow:

[2] For BIT I_{70}:
Even=$(I_{13}+...+I_{18})+I_{20}+I_{22}+I_{24}+I_{25}+I_{28}+I_{29}+I_{31}+I_{32}+I_{33}+I_{35}+I_{36}+I_{38}+I_{41}+I_{44}+I_{45}+I_{46}+I_{50}+(I_{52}+...+I_{55})+I_{58}+I_{60}+I_{64}+I_{65}+I_{70}$

[3] For BIT I_{71}:
Even=$(I_{14}+...+I_{19})+I_{21}+I_{23}+I_{25}+I_{26}+I_{29}+I_{30}+I_{32}+I_{33}+I_{34}+I_{36}+I_{37}+I_{39}+I_{42}+I_{45}+I_{46}+I_{47}+I_{51}+(I_{53}+...+I_{56})+I_{59}+I_{61}+I_{65}+I_{66}+I_{71}$

[4] For BIT I_{72}:
Even=$(I_{15}+...+I_{20})+I_{22}+I_{24}+I_{26}+I_{27}+I_{30}+I_{31}+I_{33}+I_{34}+I_{35}+I_{37}+I_{38}+I_{40}+I_{43}+I_{46}+I_{47}+I_{48}+I_{52}+(I_{54}+...+I_{57})+I_{60}+I_{62}+I_{66}+I_{67}+I_{72}$

[5] For BIT I_{73}:
Even=$(I_{16}+...+I_{21})+I_{23}+I_{25}+I_{27}+I_{28}+I_{31}+I_{32}+I_{34}+I_{35}+I_{36}+I_{38}+I_{39}+I_{41}+I_{44}+I_{47}+I_{48}+I_{49}+I_{53}+(I_{55}+...+I_{58})+I_{61}+I_{63}+I_{67}+I_{68}+I_{73}$

[6] For BIT I_{74}:
Even=$(I_{17}+...+I_{22})+I_{24}+I_{26}+I_{28}+I_{29}+I_{32}+I_{33}+I_{35}+I_{36}+I_{37}+I_{39}+I_{40}+I_{42}+I_{45}+I_{48}+I_{49}+I_{50}+I_{54}+(I_{56}+...+I_{59})+I_{62}+I_{64}+I_{68}+I_{69}+I_{74}$

[7] For BIT I_{75}:
Even=$(I_{13}+...+I_{17})+I_{19}+I_{21}+I_{23}+I_{24}+I_{27}+I_{28}+I_{30}+I_{31}+I_{32}+I_{34}+I_{35}+I_{37}+I_{40}+I_{43}+I_{44}+I_{45}+I_{49}+(I_{51}+...+I_{54})+I_{57}+I_{59}+I_{63}+I_{64}+I_{69}+I_{75}$

[8] For BIT I_{76}:
Even=$I_{13}+I_{14}+...+I_{75}+I_{76}$

[9] Note 2: Code for I_{56} is: 0=conical; 1=planar.

[10] Note 3: The convention for the coding of negative numbers is as follows: −MSB is the sign bit; 0=+; 1=−.

[11] −Other bits represent the absolute value.

[12] The convention for the antenna location is as follows: As viewed from the MLS approach reference datum looking toward the datum point, a positive number shall represent a location to the right of the runway centerline (lateral offset) or above the runway (vertical offset), or towards the stop end of the runway (longitudinal distance).

[13] The convention for the antenna alignment is as follows: As viewed from above, a positive number shall represent clockwise rotation from the runway centerline to the respective zero-degree guidance plane.

[14] Note 4: Data Word A3 is transmitted at intervals of 1.0 seconds or less throughout the approach Azimuth coverage sector, except when back Azimuth guidance is provided. Where back Azimuth is provided transmit at intervals of 1.33 seconds or less throughout the approach Azimuth sector and 4.0 seconds or less throughout the back Azimuth coverage sector.

[15] Note 5: When back Azimuth guidance is provided, transmit at intervals of 1.33 seconds or less throughout the back Azimuth coverage sector and 4.0 seconds or less throughout the approach Azimuth coverage sector.

[16] Note 6: The designation "A1" represents the function identification code for "Auxiliary Data A" and address code number 1.

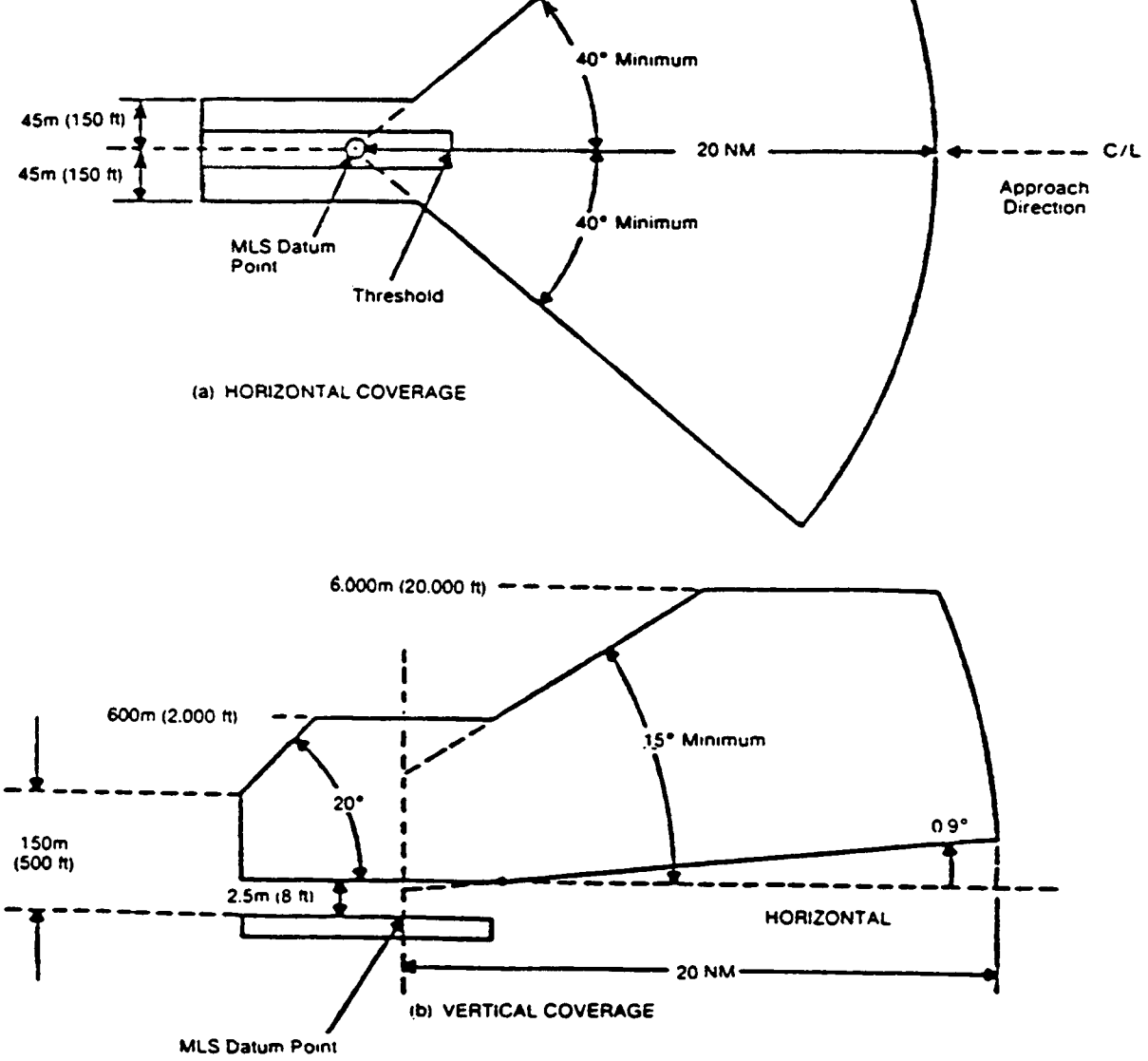
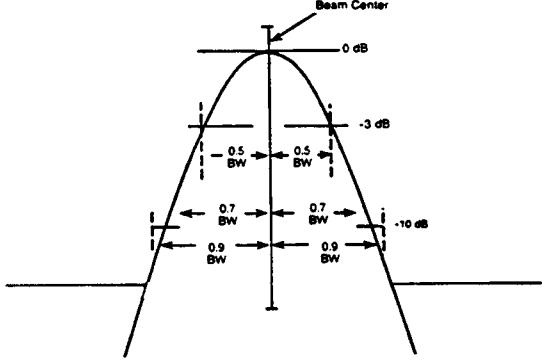


FIGURE 9—Approach Azimuth/Data Coverage.]



NOTES: 1. The beam envelope is smoothed by a 26 kHz video filter before measurement.
2. BW = Beamwidth.

FIGURE 10—Far field dynamic signal in space.

(5) Antenna far field pattern in the vertical plane. The azimuth antenna free space radiation pattern below the horizon must have a slope of at least —8 dB/degree at the horizon and all sidelobes below the horizon must be at least 13 dB below the pattern peak. The antenna radiation pattern above the horizon must satisfy both the system coverage requirements and the spurious radiation requirement.

(6) *Data antenna.* The data antenna must have horizontal and vertical patterns as required for its function.

(g) Back azimuth coverage requirements. The back azimuth equipment where used must provide guidance information in at least the following volume of space (see Figure 11):

(1) Horizontally within a sector ±40 degrees about the runway centerline originating at the back azimuth ground equipment antenna and extending in the direction of the missed approach at least to 20 nautical miles from the runway stop end. The minimum proportional guidance sector must be ±10 degrees about the runway centerline. Clearance signals must be used to provide the balance of the required coverage where the proportional sector is less than ±40 degrees.

(2) Vertically in the runway region between:

(i) A horizontal surface 2.5 meters (8 feet) above the farthest point of runway centerline (8 feet) above the runway stop end, included at 0.9 degree above the horizontal, and,

(ii) A conical surface orginating at the missed approach azimuth ground equipment antenna, inclined at 15 degrees above the horizontal up to a height of 1500 meters (5000 feet).

(iii) Where obstacles penetrate the lower coverage limits, coverage need be provided only to minimum line of sight.

(4) Within the back azimuth coverage sector defined in paragraph (q) (1), (2), and (3) of this section the power densities must not be less than those shown in Table 9, but the equipment design must also allow for:

(i) Transmitter power degradation from normal —1.5 dB.

(ii) Rain loss of —2.2 dB at the longitudinal coverage extremes.

(h) Back azimuth siting. The back azimuth equipment antenna must:

(1) Normally be located on the extension of the runway centerline at the threshold end;

(2) Be adjusted so that the vertical plane containing the zero degree course line contains the back azimuth reference datum;

(3) Have minimum height necessary to comply with the course requirements prescribed in paragraph (g) of this section;

(4) Be located at a distance from the threshold end that is consistent with safe obstruction clearance practices;

(5) Not obscure any light of an approach lighting system; and

(6) Be installed on frangible mounts or beyond the 300 meter (1000 feet) light bar.

(i) Back azimuth antenna coordinates. The scanning beams transmitted by the back azimuth equipment may be either conical or planar.

(j) *Back azimuth accuracy.* The requirements specified in § 171.313(e) apply except that the reference point is the back azimuth reference datum.

(k) Back azimuth antenna characteristics. The requirements specified in § 171.313(f) apply.

NOTE: False courses may be due to (but not limited to) MLS airborne receiver acquisition of the following types

a warning must be provided at the designated control point if any of the following conditions persist for longer than the periods specified:

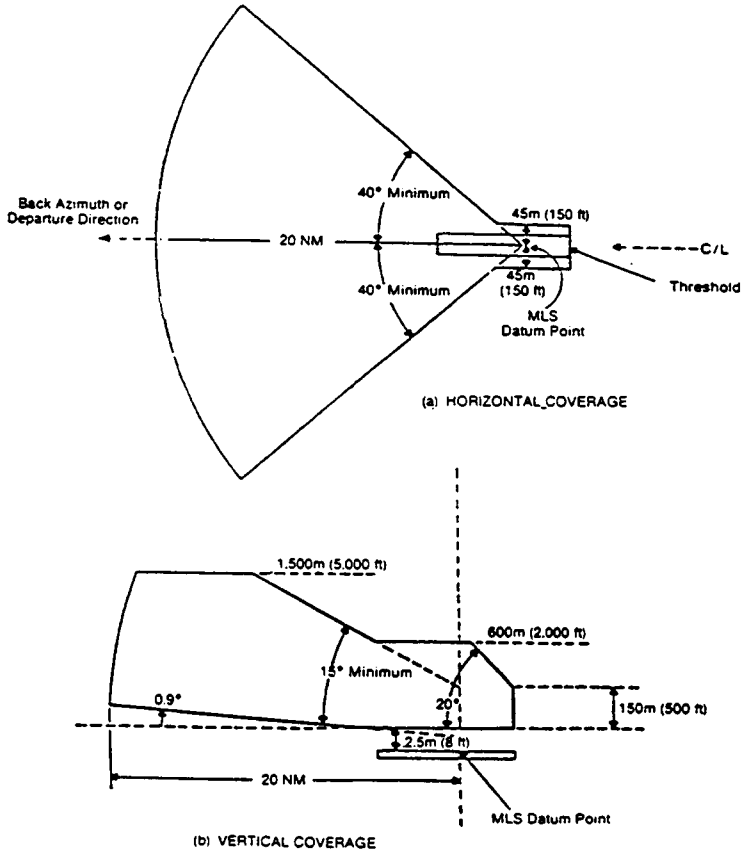


FIGURE 11—Back Aximuth/Data Coverage.

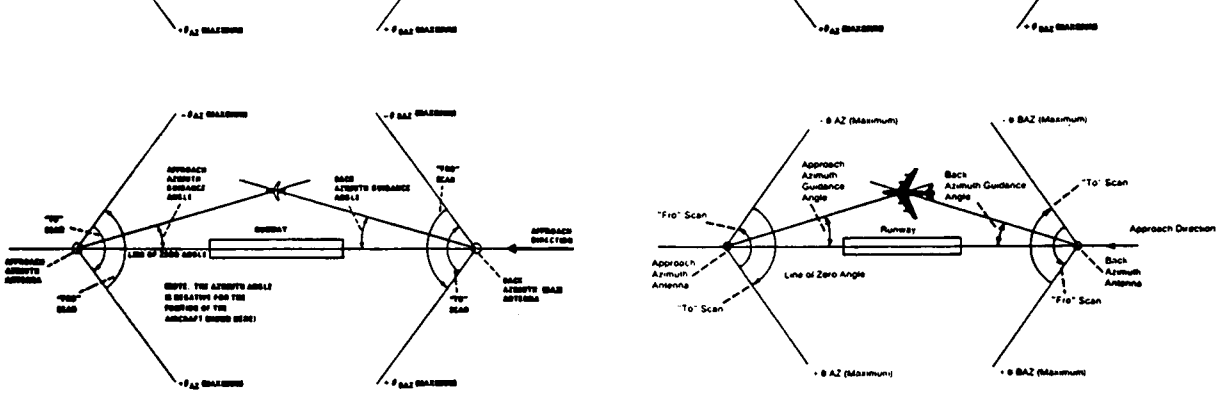


FIGURE 12—Azimuth Guidance Functions Scanning Conventions.

(1) There is a change in the ground equipment contribution to the mean course error component such that the path following error at the reference datum or in the direction of any azimuth radial, exceeds the limits specified in §§ 171.313(e)(1) or 171.313(j) for a period of more than one second.

NOTE: The above requirement and the requirement to limit the ground equipment mean error to ±10 ft. can be satisfied by the following procedure. The integral monitor alarm limit should be set to the angular equivalent of ±10 ft. at the approach reference datum. This will limit the electrical component of the mean course error to ±10 ft. The field monitor alarm limit should be set such that with the mean course error at the alarm limit the total allowed PFE is not exceeded on any commissioned approach course from the limit of coverage to an altitude of 100 feet.

(2) There are errors in two consecutive transmissions of Basic Data Words 1, 2, 4 or 5.

(3) There is a reduction in the radiated power to a level not less than that specified in §171.313(a)(4) or § 171.313(g)(4) for a period of more than one second.

(4) There is an error in the preamble DPSK transmissions which occurs more than once in any one second period.

(5) There is an error in the time division multiplex synchronization of a particular azimuth function that the requirement specified in § 171.311(e) is not satisfied and if this condition persists for more than one second.

(6) A failure of the monitor is detected.

(b) Radiation of the following fuctions must cease and a warning provided at the designated control point if there are errors in 2 consecutive transmissions:

(1) Morse Code Identification,

(2) Basic Data Words 3 and 6,

(3) Auxiliary Data Words.

(c) The period during which erroneous guidance information is radiated must not exceed the periods specified in § 171.315(a). If the fault is not cleared within the time allowed, the ground equipment must be shut down. After shutdown, no attempt must be made to restore service until a period of 20 seconds has elapsed.

§ 171.317 Approach elevation performance requirements.

This section prescribes the performance requirements for the elevation equipment components of the MLS as follows:

(a) *Elevation coverage requirements.* The approach elevation facility must provide propor-

(3) Vertically within the sector bounded by:

(20,000 feet).

to the true glidepath angle with a maximum error of 0.01 degree. Additionally, the elevation antenna bias adjustment must be electronically steerable at least to the monitor limits in steps not greater than 0.005 degrees.

(4) *Antenna far field patterns in the plane of scan.* On the lowest operationally required glidepath, the antenna mainlobe pattern must conform to Figure 10, and the beamwidth must be such that in the installed environment, no significant ground reflections of the mainlobe exist. In any case, the beamwidth must not exceed 2 degrees. The antenna mainlobe may be allowed to broaden from the value at boresight by a factor of $1/\cos\theta$, where θ is the angle of boresight. Anywhere within coverage, the −3 dB width of the antenna mainlobe, while scanning normally, must not be less than 25 microseconds (0.5 degrees) or greater than 250 microseconds (5 degrees). The sidelobe levels must be as follows:

(i) *Dynamic sidelobe levels.* With the antenna scanning normally, the dynamic sidelobe level that is detected by a receiver at any point within the proportional coverage sector must be down at least 10 dB from the peak of the mainlobe. Outside the proportional coverage sector, the radiation from the scanning beam antenna must be of such a nature that receiver warnings will not be removed or a suitable OCI signal must be provided.

(ii) *Effective sidelobe levels.* With the antenna scanning normally, the sidelobe levels in the plane of scan must be such that, when reflected from the ground, the resultant PFE along any glidepath does not exceed 0.083 degrees.

(5) *Antenna far field pattern in the horizontal plane.* The horizontal pattern of the antenna must gradually de-emphasize the signal away from antenna boresight. Typically, the horizontal pattern should be reduced by at least 3 dB at 20 degrees off boresight and by at least 6 dB at 40 degrees off boresight. Depending on the actual multipath conditions, the horizontal radiation patterns may require more or less de-emphasis.

by the use of OCI.

NOTE: False courses may be due to (but not limited to) MLS airborne receiver acquisition of the following types of false guidance: reflections of the scanning beam and scanning beam antenna sidelobes and grating lobes.

§ 171.319 Approach elevation monitor system requirements.

(a) The monitor system must act to ensure that any of the following conditions do not persist for longer than the periods specified when:

(1) There is a change in the ground component contribution to the mean glidepath error component such that the path following error on any glidepath exceeds the limits specified in § 171.317(d) for a period of more than one second.

NOTE: The above requirement and the requirement to limit the ground equipment mean error to ±0.067 degree can be satisfied by the following procedure. The integral monitor alarm limit should be set to ±0.067 degree. This will limit the electrical component of mean glidepath error to ±0.067 degree. The field monitor alarm limit should be set such that with the mean glidepath error at the alarm limit the total allowed PFE is not exceeded on any commissioned glidepath from the limit of coverage to an altitude of 100 feet.

(2) There is a reduction in the radiated power to a level not less than that specified in § 171.317(a)(4) for a period of more than one second.

(3) There is an error in the preamble DPSK transmission which occurs more than once in any one second period.

(4) There is an error in the time division multiplex synchronization of a particular elevation function such that the requirement specified in § 171.311(e) is not satisfied and this condition persists for more than one second.

(5) A failure of the monitor is detected.

(b) The period during which erroneous guidance information is radiated must not exceed the periods specified in § 171.319(a). If the fault is not cleared within the time allowed, radiation shall cease. After

formance features must comply with International Standards and Recommended Practices, Aeronautical Telecommunications, Vol. I of Annex 10 to ICAO. It is available from ICAO, Aviation Building, 1080 University Street, Montreal 101, Quebec, Canada, Attention: Distribution Officer and also available for inspection at the Office of the Federal Register Information Center, Room 8301, 1100 L Street, NW., Washington, DC 20408.

(b) MLS marker beacon equipment must meet the performance requirements prescribed in Subpart H of this Part. This subpart imposes requirements that performance features must comply with International Standards and Recommended Practices, Aeronautical Telecommuncations, Vol. I of Annex 10 to ICAO.

§ 171.323 Fabrication and installation requirements.

(a) The MLS facility must be permanent and must be located, constructed, and installed in accordance with best commercial engineering practices, using applicable electric and safety codes and Federal Communications Commission (FCC) licensing requirements and siting requirements of §§ 171.313(b) and 171.317(b).

(b) The MLS facility components must utilize solid state technology except that traveling wave tube amplifiers (TWTA) may be used. A maximum level of common modularity must be provided along with diagnostics to facilitate maintenance and troubleshooting.

(c) An approved monitoring capability must be provided which indicates the status of the equipment at the site and at a remotely located maintenance area, with monitor capability that provides pre-alarm of impending system failures. This monitoring feature must be capable of transmitting the status and pre-alarm over standard phone lines to a remote section. In the event the sponsor requests the FAA to assume ownership of the facility, the monitoring feature must also be capable of interfacing with FAA remote monitoring requirements. This requirement may be complied with by the addition of optional software and/or hardware in space provided in the original equipment.

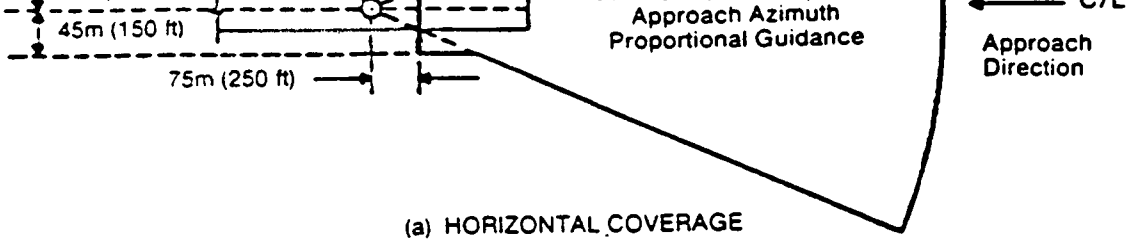
angle system must not be less than 1,500 hours. This measure applies to unscheduled outage, out-of-tolerance conditions, and failures of the monitor, transmitter, and associated antenna assemblies.

(f) The MLS facility must have a reliable source of suitable primary power, either from a power distribution system or locally generated. Adequate power capacity must be provided for the operation of the MLS as well as the test and working equipment of the MLS.

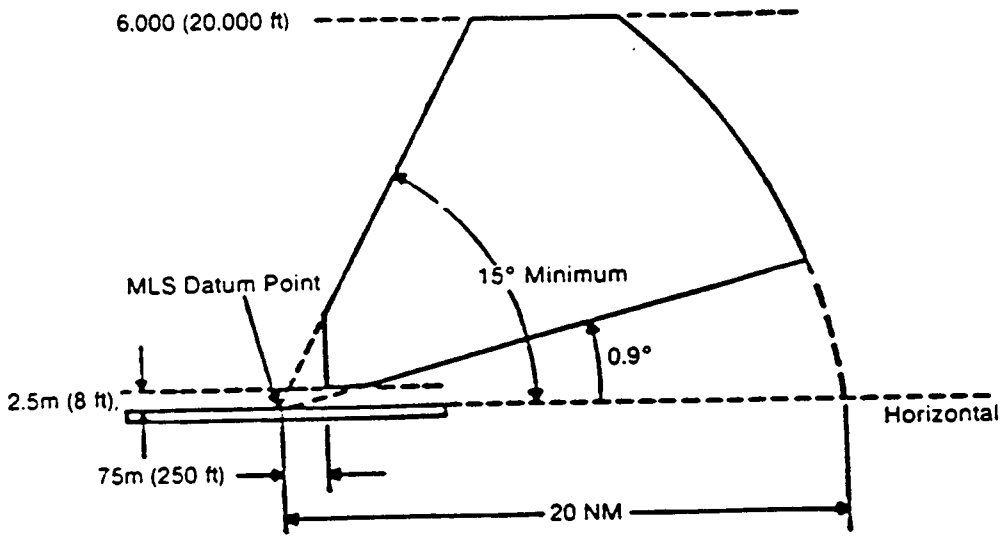
(g) The MLS facility must have a continuously engaged or floating battery power source for the continued normal operation of the ground station operation if the primary power fails. A trickle charge must be supplied to recharge the batteries during the period of available primary power. Upon loss and subsequent restoration of power, the battery must be restored to full charge within 24 hours. When primary power is applied, the state of the battery charge must not affect the operation of the MLS ground station. The battery must allow continuation of normal operation of the MLS facility for at least 2 hours without the use of additional sources of power. When the system is operating from the battery supply without prime power, the radome deicers and the environmental system need not operate. The equipment must meet all specification requirements with or without batteries installed.

(h) There must be a means for determining, from the ground, the performance of the system including antenna, both initially and periodically.

(i) The facility must have, or be supplemented by ground, air or landline communications services. At facilities within or immediately adjacent to air traffic control areas, that are intended for use as instrument approach aids for an airport, there must be ground air communications or reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communication facility. Compliance with this paragraph need not be shown at airports where an adjacent FAA facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to air traffic control zones or areas,



(a) HORIZONTAL COVERAGE



(b) VERTICAL COVERAGE

FIGURE 13—Approach elevation coverage.

section, the power densities must not be less than those shown in Table 9, but the equipment design must also allow for:

(i) Transmitter power degradation from normal by -1.5 dB.

(ii) Rain loss of -2.2 dB at the coverage extremes.

(b) *Elevation siting requirements.* The Elevation Antenna System must:

(1) Be located as close to runway centerline as possible (without violating obstacle clearance criteria).

(2) Be located near runway threshold such that the asymptote of the minimum glidepath crosses the threshold of the runway at the Approach Reference Datum height. Normally, the minimum glidepath should be 3 degrees and the Approach Reference Datum height should be 50 feet. However, there are circumstances where other glideslopes and reference datum heights are appropriate. Some of these instances are discussed in FAA Order 8260.34 (Glide Slope Threshold Crossing Height Requirements) and Order 8260.3 (IFR Approval of MLS.)

(3) Be located such that the MLS Approach Reference Datum and ILS Reference Datum heights are coincident within a tolerance of 3 feet when MLS is installed on a runway already served by an ILS. This requirement applies only if the ILS glide slope is sited such that the height of the reference datum meets the requirements of FAA Order 8260.34.

(c) *Antenna coordinates.* The scanning beams transmitted by the elevation subsystem must be conical.

(d) *Elevation accuracy.* (1) The accuracies shown in Table 13 are required at the approach reference datum. From the approach reference datum to the coverage limit, the PFE, PFN and CMN limits shall be allowed to linearly increase as follows:

(i) With distance along the runway centerline extended at the minimum glide path angle, by a factor of 1.2 for the PFE and PFN limits and to ±0.10 degree for the CMN limits;

APPROACH REFERENCE DATUM

Error type	System	Angular error (degrees)	
		Ground subsystem	Airborne subsystem [4]
PFE	[1 2] ±0.133	([3])	±0.017
CMN	[1]±0.050	±0.020	±0.010

Notes:

[1] Includes errors due to ground and airborne equipment and propagation effects.

[2] The system PFN component must not exceed ±0.087 degree.

[3] The mean (bias) error component contributed by the ground equipment should not exceed ±0.067 degree.

[4] The airborne subsystem angular errors are provided for information only.

(iv) With decreasing elevation angle from +3 degrees (or 60% of the minimum glide path angle, whichever is less) to the coverage extreme, by a factor of 3 for the PFE, PFN and CMN limits; and

(v) Maximum angular limits. the CMN limits shall not exceed ±0.10 degree in any coverage region within ±10 degrees laterally of runway centerline extended which is above the elevation angle specified in (iv) above.

NOTE: It is desirable that the CMN not exceed ±0.10 degree throughout the coverage region above the elevation angle specified in paragraph (d)(1)(iv) of this section.

(2) The system and ground subsystem accuracies shown in Table 13 are to be demonstrated at commissioning as maximum error limits. Subsequent to commissioning, the accuracies are to be considered at 95% probability limits.

(e) Elevation antenna characteristics are as follows:

(1) *Drift.* Any elevation angle as encoded by the scanning beam at any point within the coverage sector must not vary more than 0.04 degree over the range of service conditions specified in § 171.309(d) without the use of internal environmental controls. Multipath effects are excluded from this requirement.

(2) *Beam pointing errors.* The elevation angle as encoded by the scanning beam at any point within the coverage sector must not deviate from the true elevation angle at that point by more than

[*(i) The facility must have, or be supplemented by, ground, air, or landline communications services. At facilities within or immediately adjacent to controlled airspace, that are intended for use as instrument approach aids for an airport, there must be ground air communications or reliable communications (at least a landline telephone) from the airport to the nearest FAA air traffic control or communication facility. Compliance with this paragraph need not be shown at airports where an adjacent FAA facility can communicate with aircraft on the ground at the airport and during the entire proposed instrument approach procedure. In addition, at low traffic density airports within or immediately adjacent to controlled airspace, and where extensive delays are not a factor, the requirements of this paragraph may be reduced to reliable communications from the airport to the nearest FAA air traffic control or communications facility. If the adjacent FAA facility can communicate with aircraft during the proposed instrument approach procedure down to the airport surface or at least down to the minimum en route altitude, this would require at least a landline telephone.*]

(j) The location of the phase center for all antennas must be clearly marked on the antenna enclosures.

(k) The latitude, longitude and mean sea level elevation of all MLS antennas, runway threshold and runway stop end must be determined by survey with an accuracy of ±3 meters (±10 feet) laterally and ±0.3 meter (±1.0 foot) vertically. The relative lateral and vertical offsets of all antenna phase centers, and both runway ends must be determined with an accuracy of ±0.3 meter (±1.0 foot) laterally and ±0.03 meter (±0.1 foot) vertically. The owner must bear all costs of the survey. The results of this survey must be included in the ''operations and maintenance'' manual required by section 171.325 of this subpart and will be noted on FAA Form 198 required by § 171.327.

[(Amdt. 171–16, Eff. 9/16/93)]

demonstrate that he has the special knowledge and skills needed to maintain an MLS facility, including proficiency in maintenance procedures and the use of specialized test equipment.

(b) In the event of out-of-tolerance conditions or malfunctions, as evidenced by receiving two successive pilot reports, the owner must close the facility by encasing radiation, and issue a ''Notice to Airmen'' (NOTAM) that the facility is out of service.

(c) The owner must prepare, and obtain approval of, an operations and maintenance manual that sets forth mandatory procedures for operations, periodic maintenance, and emergency maintenance, including instructions on each of the following:

(1) Physical security of the facility.

(2) Maintenance and operations by authorized persons.

(3) FCC licensing requirements for operations and maintenance personnel.

(4) Posting of licenses and signs.

(5) Relations between the facility and FAA air traffic control facilities, with a description of the boundaries of controlled airspace over or near the facility, instructions for relaying air traffic control instructions and information, if applicable, and instructions for the operation of an air traffic advisory service if the facility is located outside of controlled airspace.

(6) Notice to the Administrator of any suspension of service.

(7) Detailed and specific maintenance procedures and servicing guides stating the frequency of servicing.

(8) Air-ground communications, if provided, expressly written or incorporating appropriate sections of FAA manuals by reference.

(9) Keeping the station logs and other technical reports, and the submission of reports required by § 171.327.

(10) Monitoring of the MLS facility.

(11) Inspections by United States personnel.

(12) Names, addresses, and telephone numbers of persons to be notified in an emergency.

of the MLS facility that may require shutdown or recertification of the MLS facility by FAA flight check.

(17) Procedures for conducting a ground check of the azimuth and elevation alignment.

(18) The following information concerning the MLS facility:

(i) Facility component locations with respect to airport layout, instrument runways, and similar areas.

(ii) The type, make and model of the basic radio equipment that provides the service including required test equipment.

(iii) The station power emission, channel, and frequency of the azimuth, elevation, DME, marker beacon, and associated compass locators, if any.

(iv) The hours of operation.

(v) Station identification call letters and method of station identification and the time spacing of the identification.

(vi) A description of the critical parts that may not be changed, adjusted, or repaired without an FAA flight check to confirm published operations.

(d) The owner or his maintenance representative must make a ground check of the MLS facility periodically in accordance with procedures approved by the FAA at the time of commissioning, and must report the results of the checks as provided in § 171.327.

(e) The only modifications permitted are those that are submitted to FAA for approval by the MLS equipment manufacturer. The owner or sponsor of the facility must incorporate these modifications in the MLS equipment. Associated changes must also be made to the operations and maintenance manual required in paragraph (c) of this section. This and all other corrections and additions to this operations and maintenance manual must also be submitted to FAA for approval.

(f) The owner or the owner's maintenance representative must participate in inspections made by the FAA.

(g) The owner must ensure the availability of a sufficient stock of spare parts, including solid state components, or modules to make possible the requirements for ground and flight inspection. The monitor must be checked daily during the in-service test evaluation period (96 hour burn in) for calibration and stability. These tests and ground checks or azimuth, elevation, DME, and marker beacon radiation characteristics must be conducted in accordance with the maintenance requirements of this section.

§ 171.327 Operational records.

The owner of the MLS facility or his maintenance representative must submit the following operational records at the indicated time to the appropriate FAA regional office where the facility is located.

(a) Facility Equipment Performance & Adjustment Data (FAA Form 198). The FAA Form 198 shall be filled out by the owner or his maintenance representative with the equipment adjustments and meter readings as of the time of facility commissioning. One copy must be kept in the permanent records of the facility and two copies must be sent to the appropriate FAA regional office. The owner or his maintenance representative must revise the FAA Form 198 data after any major repair, modernization, or retuning to reflect an accurate record of facility operation and adjustment.

(b) Facility Maintenance Log (FAA Form 6030–1). FAA Form 6030–1 is permanent record of all the activities required to maintain the MLS facility. The entries must include all malfunctions met in maintaining the facility including information on the kind of work and adjustments made, equipment failures, causes (if determined) and corrective action taken. In addition, the entries must include completion of periodic maintenance required to maintain the facility. The owner or his maintenance representative must keep the original of each form at the facility and send a copy to the appropriate FAA regional office at the end of each month in which it is prepared. However, where an FAA approved remote monitoring system is installed which precludes the need for periodic maintenance visits to the facility, monthly reports from the remote monitoring system control point must be